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UNITED STATES FOREIGN POLICY

DEVELOPMENTS IN MILITARY TECHNOLOGY AND THEIR IMPACT ON UNITED STATES STRATEGY AND FOREIGN POLICY

A STUDY

PREPARED AT THE REQUEST OF THE

COMMITTEE ON FOREIGN RELATIONS

UNITED STATES SENATE

BY

THE WASHINGTON CENTER
OF FOREIGN POLICY RESEARCH
THE JOHNS HOPKINS UNIVERSITY

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PREFACE

By Senator J. W. Fulbright, Chairman, Committee on Foreign Relations

In January of 1958 the Committee on Foreign Relations decided to undertake a review of conditions and trends in the world and of the policies and programs of the United States with respect thereto. That review grew, in part at least, out of the concern of the committee over the impact which Soviet scientific achievements might have upon our relations with the rest of the world.

From time to time throughout the spring of 1958, the committee held public hearings on U.S. policies respecting the Far East, the Near East, south Asia, Africa, Europe, Latin America, and Canada. Those hearings were limited in nature and served primarily to focus attention on the principal policies and problems of the United States in its relations with the rest of the world. For the most part, the hearings were limited to receiving testimony from the principal officers of the Department of State concerned with various geographic parts of the world. The committee also sought the testimony of selected nongovernmental witnesses with special knowledge of the areas under examination.

The hearings during the spring of 1958, the focus given to our relations with Latin America as a result of Vice President Nixon's visit there, and, lastly, the then critical situation in the Middle East, all contributed to the committee's belief that the time had come for an exploration in depth of U.S. foreign policies throughout the world.

As a consequence of these factors, the Committee on Foreign Relations, in an executive session on May 20, 1958, authorized its Subcommittee on American Republics Affairs to undertake a study of United States-Latin American relations. At the same time, the committee established a special subcommittee consisting of Senators Green, Fulbright, Wiley, and Hickenlooper, and directed it to explore the feasibility and desirability of a broad study of U.S. foreign policy throughout the world.

Subsequently, this subcommittee reported to the full Committee on Foreign Relations that it was feasible and desirable that the committee undertake such a study of foreign policy. It was felt a study of this nature might serve to develop fresh ideas and approaches to the foreign policy of the Nation and lead to a better national understanding of international problems and to more efficient and effective administration of our international operations.

On July 15, 1958, the Committee on Foreign Relations voted to report to the Senate a resolution authorizing the study. The Senate adopted this resolution (S. Res. 336, 85th Cong., 2d sess.) on July 31, 1958. The resolution authorized the Committee on Foreign Relations to "make a full and complete study of U.S. foreign policy." Without

limiting the scope of the study authorized, the committee was instructed to direct its attention to the following subjects:

1. The concepts which govern the relations of the United States with the principal nations and geographic areas of the world, and the policies by which these concepts are pursued;
2. The present state of the relations of the United States with the principal nations and geographic areas of the world;
3. The administration and coordination of policies and programs by the Department of State and such other departments and agencies of the executive branch which engage in substantial activities abroad; and
4. The relationship of other policies and activities of the Government and private activity which exert a significant influence on the relations of the United States with the rest of the world.

In the conduct of its study, the committee was authorized to "use the experience, knowledge, and advice of private organizations, schools, institutions, and individuals * * *" and to "enter into contracts for this purpose." It was directed to complete its study by June 1960, and not to exceed $300,000 was made available to meet the expenses of the committee. The committee was authorized to continue this study by the terms of Senate Resolution 31 (86th Cong., 1st sess.).

Shortly after Senate Resolution 336 was adopted by the Senate, Senator Green, then chairman of the Committee on Foreign Relations, designated me to serve as chairman of an executive committee, consisting of Senators Sparkman, Hickenlooper, and Aiken, which was given the responsibility for directing and coordinating the study.

On September 16 and 17, 1958, the executive committee discussed with a group of distinguished private citizens the general problems involved and the most advantageous approaches to them. Taking part in these discussions, besides the members of the executive committee, were Robert Bowie of Harvard University, former Ambassador William G. Bullitt, Robert Calkins of the Brookings Institution, John Cowles of the Minneapolis Star & Tribune, William Diebold of the Council on Foreign Relations, Henry Luce of Time-Life, Inc., Walter Millis of the Fund for the Republic, and Dean Rusk of the Rockefeller Foundation.

Following these meetings the executive committee developed its plans and announced on October 15 that it was prepared to invite private research organizations and institutions to submit proposals on a series of 15 studies which the committee expected to have undertaken in connection with its examination of foreign policy. As a result of this announcement, the committee received over 50 proposals from organizations and institutions interested in undertaking one or more of these studies.

On January 5, 1959, the executive committee met again to consider the proposals which had been received and decided which organizations and institutions should be asked to undertake studies for the committee. Set forth below are the titles of the studies being undertaken and the names of the organizations and institutions responsible for these studies.

STUDIES

The Nature of Foreign Policy and the Role of the United States in the World. Council on Foreign Relations, Inc., 58 East 68th Street, New York, N.Y. (Published as Study No. 7 on November 25, 1959.)

The Operational Aspects of U.S. Foreign Policy. Maxwell Graduate School of Citizenship and Public Affairs, Syracuse University, Syracuse, N.Y. (Published as Study No. 6 on November 11, 1959.)

The Principal Ideological Conflicts, Variations Thereon, Their Manifestations, and Their Present and Potential Impact on the Foreign Policy of the United States. Center for International Affairs, Harvard University, 6 Divinity Avenue, Cambridge, Mass.

Worldwide and Domestic Economic Problems and Their Impact on the Foreign Policy of the United States. Corporation for Economic and Industrial Research, Inc., 1200 Jefferson Davis Highway, Arlington, Va. (Published as Study No. 1 in August 1959.)

Foreign Policy Implications for the United States of Economic and Social Conditions in Lesser Developed and Uncommitted Countries. Center for International Studies, Massachusetts Institute of Technology, Cambridge, Mass.

Developments in Military Technology and Their Impact on U.S. Strategy and Foreign Policy. The Washington Center of Foreign Policy Research, The Johns Hopkins University, 1906 Florida Avenue NW., Washington, D.C.

Possible Nonmilitary Scientific Developments and Their Potential Impact on Foreign Policy Problems of the United States. Stanford Research Institute, Menlo Park, Calif. (Published as Study No. 2 in September 1959.)

The Role of Multilateral Organizations in the Formulation and Conduct of U.S. Foreign Policy. The Brookings Institution, 722 Jackson Place NW., Washington, D.C.

Formulation and Administration of U.S. Foreign Policy. The Brookings Institution, 722 Jackson Place NW., Washington, D.C.

U.S. Foreign Policy in Western Europe. Foreign Policy Research Institute, University of Pennsylvania, Philadelphia, Pa. (Published as Study No. 3 on October 15, 1959.)

U.S. Foreign Policy in the U.S.S.R. and Eastern Europe. The Russian Institute, Columbia University, New York, N.Y.

U.S. Foreign Policy in the Near East. Institute for Mediterranean Affairs, Inc., 27 East 62d Street, New York, N.Y.

U.S. Foreign Policy in South Asia. Conlon Associates, Ltd., 310 Clay Street, San Francisco, Calif. (Published in Study No. 5 on November 1, 1959.)

U.S. Foreign Policy in Africa. Program of African Studies, Northwestern University, Evanston, Ill. (Published as Study No. 4 on October 23, 1959.)

U.S. Foreign Policy in the Far East and Southeast Asia. Conlon Associates, Ltd., 310 Clay Street, San Francisco, Calif. (Published in Study No. 5 on November 1, 1959.)

Each of these organizations and institutions will submit a study to the committee.

Broadly speaking, I hope these studies will supply essential background to enable the Committee on Foreign Relations to accomplish the following basic purposes:

1. Provide the Senate and the American people with a simple, understandable, and forthright statement of the basic foreign policy aims of the United States which reflects the motivations and aspirations of the American people.

2. Identify those forces, domestic as well as foreign, which now or in the future may tend to frustrate or to promote the basic foreign policy aims of the United States.

3. Suggest, and if possible, determine, feasible ways to deal with such forces so that they may promote the basic foreign policy aims of the United States.

4. Examine the impact of those forces and trends, foreign and domestic, upon the conduct of American foreign policy in the various geographic areas of the world.

5. Examine the foreign policy decisionmaking machinery to determine whether it is of the maximum efficiency consistent with our democratic process.

At the January 5 meeting the executive committee also decided to send a letter to some 50 retired Foreign Service officers "to endeavor to obtain for the use of the committee the personal views of men of practical experience with respect to the foreign policy of the United States." Each of these retired Foreign Service officers was asked to give the committee his "general commentary on what is right with our policies, what is wrong with our policies, and what action (or inaction) might in your opinion best serve our interest in the future."

On June 15, 1959, the committee made public, in a summarized form and without personal attribution, the substance of the views of former members of the Foreign Service who responded to the letter. The views and attitudes expressed in that committee publication deserve the most careful consideration by officials in the executive branch of the Government, by my colleagues in the Senate, and by all citizens interested in the conduct of our foreign policy.

The study printed in this volume, "Developments in Military Technology and Their Impact on United States Strategy and Foreign Policy," is the ninth of the 15 principal studies the committee expects to publish. It was designed to help the committee find answers to subjects covered in an outline developed in consultations between representatives of the committee and representatives of The Washington Center of Foreign Policy Research, The Johns Hopkins University. A copy of the outline appears in the appendix. (See pp. 119–120.)

I take this occasion to emphasize that the studies which are received will supply the committee with background material for consideration in preparing a final report to the Senate. The committee is, of course, free to accept or to reject the findings and recommendations of the organizations and institutions submitting studies. It is the function of the committee to evaluate the studies which are submitted. Prior to the preparation of a final report, the committee will hold public hearings to receive testimony from all interested parties. In that way it will be possible for the committee to test the soundness of the findings and recommendations in these studies before reaching its own conclusions and submitting its final report to the Senate.

In addition, I wish to emphasize that the committee is approaching this assignment in a nonpartisan manner, endeavoring to avoid transitory issues and to concentrate on the fundamental forces at work within and without the United States which must be understood if our foreign policy is to serve the Nation.

LETTER OF TRANSMITTAL

THE WASHINGTON CENTER OF FOREIGN POLICY RESEARCH,
Washington, D.C., October 30, 1959.

Hon. J. W. FULBRIGHT,
Chairman, Committee on Foreign Relations,
U.S. Senate,
Washington, D.C.

DEAR SENATOR FULBRIGHT: I have the honor to present to you the study on "Developments in Military Technology and Their Impact on U.S. Strategy and Foreign Policy" that was undertaken by The Washington Center of Foreign Policy Research at the request of your committee and in accordance with the contract of February 20, 1959, between your committee and The Johns Hopkins University.

Based upon the present and generally accepted aims of U.S. foreign policy, this study seeks to analyze anticipated developments in military technology during the next decade in terms of the problems and opportunities they will create for the implementation of American military strategy and the pursuit of broader national objectives.

The emphasis has been placed on weapons of strategic warfare, in the belief that technological development in this area raises the most serious problems for U.S. military strategy and foreign policy. The economic and psychological implications of foreseeable weapons developments are recognized, but no attempt is made to cover them comprehensively.

The study was prepared by Mr. James E. King, Jr., Mr. Paul H. Nitze and myself, Research Associates of the Center, and by Miss Ellen Guild and Mr. William Burden, Jr., Research Assistants of the Center. Special credit must go to Mr. King for his production of the first draft of the chapters on technological development.

Roundtable discussions at the Center and the exchanges of comments and criticism among the authors enabled them to reach agreement on a wide range of controversial aspects of the subject. However, since there remained some differences in approach, in the interpretation of facts, and in the evaluation of alternative policies, their resolution was undertaken by this writer, as editor of this study; he alone can be held responsible, therefore, for the views expressed and for the recommendations contained in this study.

The authors owe a debt of gratitude to the military specialists, particularly of the Rand Corp., and to Mr. Charles Burton Marshall and Mr. Hans J. Morgenthau, Research Associates of this Center, who read and criticized the draft, as well as to the many authors on nu-

clear strategy on whose writings they drew more heavily than the footnotes may indicate. Discussions with individuals associated with the U.S. Government in any way were held by the authors in a personal capacity only. Any opinions or information derived from such persons and incorporated in the study do not necessarily reflect official Government views.

The study is based exclusively on unclassified material, most of it accessible in published form.

Sincerely yours,

ARNOLD WOLFERS, *Director.*

DEVELOPMENTS IN MILITARY TECHNOLOGY AND THEIR IMPACT ON U.S. STRATEGY AND FOREIGN POLICY

I. SUMMARY OF MAIN FINDINGS

A. GENERAL INTRODUCTION—U.S. PURPOSES IN WORLD AFFAIRS AND U.S. NATIONAL STRATEGY

The basic purpose of American national policy is to promote and secure a structure of world relationships compatible with the values of the United States and the free world. This goal transcends a concern with narrow national security interests or mere holding operations against Communist expansion. The United States has assumed a major share of responsibility for the creation of this international economic, political, and military structure and for contesting concurrent Soviet aspirations to build a new international order on principles diametrically opposed to its own. In the cold war that has resulted from this clash of concepts, the free world has found it necessary to mobilize its means of influence and power, including its military potential, in support of the principles of the international order embodied in the United Nations Charter, and in the defense of its territories against the threat of Communist aggression. Termination of the American nuclear monopoly and growing Soviet strategic capabilities have increased the difficulties of maintaining a military posture appropriate to the pursuit of established American objectives. However, since neither retrenchment to a Fortress America nor preventive war are alternatives compatible with American interests and values, the continued pursuit of the basic U.S. national purpose, as it has evolved since World War II, appears necessary, despite the heavy burdens and risks involved.

B. U.S. INTERESTS AND FOREIGN COMMITMENTS GOVERNING U.S. DEFENSE POLICY

As long as the cold war continues, American foreign policy must be based on a defense policy designed to ward off Soviet threats against the free countries of the world. While military defense needs to be supplemented by economic, psychological, and other policies, the provision of adequate and appropriate military strength is the precondition of free world security. Broader objectives of U.S. foreign policy not emanating from the struggle with the Sino-Soviet bloc, such as the promotion of economic progress in underdeveloped countries, call for continued attention and sacrifice, but their pursuit is affected, and at times impaired, by the requirements of meeting the Soviet threat.

These military requirements are unprecedented in scope. Although

the immediate postwar American break with the traditional U.S. policy of "going-it-alone"—marked by its membership in the United Nations collective security system—placed no special burdens on existing American military resources, the subsequent creation of an alliance or collective defense system in response to the Communist threat has revolutionized the strategic picture. With the extension of the alliance's defense perimeter roughly to the borders of the Soviet bloc, the United States is faced with the dual military mission of protecting its overseas allies on the exposed Eurasian rimlands against a wide range of possible forms of Sino-Soviet aggression, as well as protecting its homeland which is no longer secure from Soviet attack. The strategies and forces appropriate to one mission are not necessarily appropriate to the other.

C. TECHNOLOGICAL DEVELOPMENTS AND THE STRATEGIC EQUATION

1. Introduction: East-West power relations

Because capabilities in strategic weapons now dominate the world distribution of power, Part C will concentrate on the impact of technological developments on the strategic level. On this level, a balance of strategic power or a "nuclear stalemate" can be said to exist when neither side can expect to destroy its opponent's ability to strike back with a retaliatory blow of unacceptable proportions. If the incentives to initiate strategic-nuclear war are low or offset by other factors, the strategic equation can be termed relatively stable.

Since technological factors alone do not determine international power relationships, Soviet and Western assets in the nontechnological elements of power must be taken into account. Neither side is at a serious disadvantage in geographic size, population, or the quality of its strategic thought, but the increased range and speed of strategic weapons has diminished two former U.S. assets: its continental security against attack and the wartime military significance of its industrial potential. The Soviet Union enjoys several assets stemming from its political system in its superior abilities to mobilize military manpower, to gather military intelligence, and to take the military initiative. The United States has vastly superior industrial capacity, but the Soviets have demonstrated technical skill, particularly in producing new weapons in a short development cycle. Increasing Soviet advantages in some elements of power demand, therefore, special Western efforts to compensate for their effects on the power distribution.

2. The assessment of technological change

The significance of new weapons developments for national military power and the strategic equation is frequently obscured or distorted by the failure to consider factors of weapon appropriateness, timing, quality, and quantity that affect the military and political utility of a new system. Even that most sweeping of changes in military technology, the introduction of nuclear weapons, did not lead to unambiguous changes in the relative military power of the two great adversaries. The period of the U.S. nuclear monopoly was also one of relatively intense Communist pressure against the free world.

It is because of the military revolution wrought by nuclear weapons, however, that the balance or imbalance of military power between the United States and the Soviet Union has assumed an importance and an urgency that it could not otherwise have had. The emphasis in later portions of this study will be on the impact of recent and foreseeable weapons developments on this equation of power and upon the strategies pursued by both antagonists.

3. Generations of military technology

The military position of the United States has declined in the short span of 15 years from one of unchallenged security to that of a nation both open and vulnerable to direct and devastating attack. This decline coincides with the rising military power of the Soviet Union, but the Soviet challenge could not have been made with such swiftness and success were it not for developments in military technology enabling that nation to threaten the security of the continental United States.

The most significant of these postwar innovations in military technology can be usefully regarded as a sequence of weapons generations—the conventional, the nuclear, and the nuclear-missile generations. Each has had a distinct and important impact on the strategic equation and the policies of both adversaries; their cumulative effect, however, has been to deprive this Nation of an unquestionably secure military position that was based on its geographic location and a comparatively advanced technology.

The advent of the nuclear-missile weapons generation, heralded by the Soviet ICBM test of August 1957, brought a drastic compression of the time required for the delivery of nuclear explosives at intercontinental ranges, and a corresponding reduction in the attack warning time available to the victim of strategic aggression. These effects, added to the fact that there is as yet no active defense whatsoever against an intercontinental ballistic missile in flight, have gravely increased the temptations to strike first in a nuclear war. They have also made an opponent's manned bomber force highly vulnerable to surprise attack by the side that first achieves a comprehensive strategic missile arm. Should the Soviets be the first to do so, and this now appears likely, the marked first-strike advantage now attributed to our Strategic Air Command would transfer to them. It is this possibility that disturbs those who see in the "missile gap" of the early 1960's the greatest danger to its security that the United States has ever faced.

A number of means to delay, or possibly to prevent, Soviet acquisition of this military advantage are attainable; they include a greater dispersal of SAC's bombers, the placing of a larger number of aircraft on high alert status, and other protective expedients. These measures cannot guarantee the preservation of our present strategic power into the early 1960's but may at least prevent the achievement of a decisive first-strike advantage by the enemy. It is unlikely that the United States could close the anticipated missile gap, or appreciably shorten this dangerous transitional period, merely by accelerating the production of our present strategic weapons.

Anticipated missile systems of the 1960's will be adaptable to hardened siting and to launching from mobile air-, land-, and sea-based

delivery vehicles whose constant movement should give them a considerable measure of protection against location and destruction by the enemy in a first strike. As such weapons are deployed in strength on both sides of the Iron Curtain, the strategic forces of both adversaries may in time come to present targets too numerous and diverse to be "taken out" in a surprise attack. The multiplication and hardening or "mobilizing" of missile systems would, at the very least, reduce the confidence that either side could place in the effectiveness of a first strike on the opposing strategic force. Should this occur, the nuclear-missile weapons generation would have entered a second stage, one characterized by the mutual possession of relatively secure retaliatory systems.

4. Prospects of new weapons generations

Progress in military technology will continue at an accelerating rate during the next decade, increasing both the performance of individual weapons systems and the number of systems that it becomes feasible to develop. The arms race is likely to be of such scope and intensity as to provide each of the two great adversaries with repeated chances to seize an important lead in areas to which they assign priority.

The area of strategic missiles, in particular, is a relatively new and unexploited field of applied science in which further technological advances of considerable magnitude and rapidity must be expected. Among these are various means of making intercontinental missiles more accurate and reliable, greater in their range and destructive power and, should this prove necessary, more difficult to detect and destroy in flight. Range extensions will permit the global dispersion of ICBM's, but accuracy and warhead improvements will be of greater significance in their effect on the number of missiles required to destroy hardened military targets. The deterrent utility of fixed U.S. missile sites may be said to vary inversely with Soviet progress in these parameters.

It does not now appear possible to develop active or passive defense systems capable of fully protecting large areas from nuclear attack, or even to provide those point targets whose locations are known to the enemy with "invulnerability" to multimegaton weapons. A high degree of national security is therefore likely to remain a goal unobtainable by military means alone during the next decade. The protection of retaliatory power will continue to depend heavily on the multiplication, dispersal and, later, the "mobilizing" of strategic weapons systems.

Foreseeable technological developments, lending themselves to the partial protection of retaliatory systems, will, if fully exploited by the United States, make a nuclear attack upon its strategic forces increasingly hazardous for the Soviet Union and correspondingly unattractive to it as a rational course of action. However, this is at best a trend, and one which is sure to be accompanied by the continued refinement of those weapons that have now made such an attack possible.

To assume that the level of mutual destruction now possible from a total nuclear war, or the magnitude and intensity of the accompany-

ing radioactive fallout, is sufficiently high to make nuclear war "suicidal" (and therefore "impossible") is but to evade the most serious military problem that this Nation has ever faced. The initiation of total war may be made increasingly hazardous for the potential aggressor, but it will remain a course open to him for at least the next decade. The United States, as the potential victim of such an attack, should have the ability to fight such a war in a rational manner and should give the most serious consideration to those civil defense measures requisite to the protection and recovery of its population.

Foreseeable progress in nuclear engineering will make possible a reduction in the costs, and consequent increase in the availability, of fissile materials. Such achievements can be expected to facilitate the nuclearizing of small wars, the nuclear arming of allies, and the spread of nuclear power to additional countries. It seems unlikely, however, that these effects will be significantly asymmetrical in their impact on the U.S.-U.S.S.R. power equation.

Progress in chemical and biological weaponry is still far from the point where toxicological warfare could be considered of strategic decisiveness. These agents present ancillary civil and military defense problems, and may add to the difficulties of arms control, but their present military utility has been exaggerated.

A broad range of evolutionary developments in tactical armament, particularly those facilitating ground and air mobility and the spread of increasingly greater firepower to lower military echelons, will make possible the rapid application of military force in even remote areas of the globe. Limited or localized conflicts may soon be much more quickly initiated, or terminated, than they have been in the past.

Operational satellite and satelloid space systems promise to become available in considerable numbers and sophistication during the next decade. Their military employment for reconnaissance missions, attack warning, and the facilitation of communication, navigation, and weather prediction will be of relative advantage to the United States in view of its existing needs for intelligence of the Soviet Union and the management of globally deployed forces. Their use for these missions will, however, sharpen existing tensions between the United States and the Soviet Union and provide fruitful sources of new ones. It appears highly unlikely that these problems can be avoided, or solved, by a distinction between "military" and "peaceful" uses of space.

The employment of manned orbiting vehicles, and of such maneuverable spacecraft as may be developed in this period, appears capable of radically altering the present strategic balance only under conditions which do not, as yet, appear probable.

It can be anticipated that the weapons systems of the next decade will, by their sheer cost and complexity, preclude nations other than the United States and the Soviet Union from attaining the status of major military powers, or even from participating in the arms race on more than the narrowest of fronts. A corollary influence of the new strategic systems will be to emphasize the power disparity between the United States and other members of the collective defense system, thus amplifying divisive strains within the present alliance and complicating the problems of preserving and strengthening the solidarity of the free world.

5. Stability versus instability in the equation of strategic power

A "stable" relationship between two or more nuclear powers is one in which circumstances and influences conducive to and favoring the initiation of total nuclear war are countered and outweighed by opposing factors.

The unprecedented level of destruction that even the aggressor must expect to suffer in a thermonuclear exchange is the principal stabilizing factor in the strategic equation today, and is likely to remain so for the decade ahead. There may remain great military advantages in striking first, but, while the aggressor must accurately deliver a large number of weapons on military targets to triumph, a much smaller number of weapons landing on his industrial and civilian complexes may rob him of the fruits of victory.

Opposing this stabilizing influence, however, are "structural instabilities" stemming from the characteristics and interaction of modern weapons systems, instabilities arising from differences of timing in the development or deployment of weapons, policy instabilities resulting from the use of war threats by powerful adversaries, and instabilities inherent in the spread of strategic nuclear weapons to a growing number of nation-states.

Characteristics of today's strategic weapons systems which tend toward instability include their vulnerability to surprise attack, the relatively low effectiveness of active defense systems, and the "hair trigger" characteristics of warning and reaction systems that make possible a war by accident or miscalculation.

Differences between adversaries in the time-phasing of weapons systems may tempt an aggressive power to exploit a temporary but powerful military advantage before it evaporates or transfers to his enemy. The fact that modern strategic weapons systems take many years to develop and deploy in adequate numbers makes it difficult to avoid such instabilities through prompt compensatory action. However, those technical sources of instability that stem from the automaticity and fast reaction of modern weapons systems do not play favorities between the adversaries; they therefore suggest and make possible common measures for their control that may include forms of arms limitation agreements.

6. Arms control and other measures for stability

The United States could do much to achieve a substantial degree of nuclear stability in the decade ahead regardless of what the Soviet Union does, or does not, agree to do. Means appropriate to this objective would include the variegation, dispersal, and protection of U.S. retaliatory weapons to reduce the Soviet temptations to strike first, mechanical safeguards to moderate the dangers of "accidental war," and changes in our policies and military capabilities that lessen the free world's present dependence on nuclear threats for its security.

But were nuclear stability to be made a prime objective of our national policy, we and our allies would have to create military means other than the threat of strategic nuclear retaliation to achieve our foreign policy goals and meet the requirements of our security. These would most probably include radical increases in the mobility, numerical strength, firepower, training, and coordination of our non-

strategic forces, to which great effort and substantial sacrifices would be requisite. A decision to opt for nuclear stability would imply a willingness to endure these sacrifices.

Although much can be done unilaterally by example, pressure, and diplomatic and military action to move toward nuclear stability, there would remain problem areas—such as the spread of strategic nuclear weapons to additional countries—in which formal agreements backed by realistic control and inspection measures might make a useful contribution.

Proposals for "total disarmament," such as those recently made by the Soviet Union, should be approached in this regard with caution. Maximum disarmament, down to the level of national police forces, is not synonymous with maximum stability and may in fact be inconsistent with it. In a totally disarmed world even a small number of secreted or clandestinely manufactured nuclear weapons could disrupt the international order and allow one power to dominate its more trusting adversaries. It is doubtful that any devisable, much less agreeable, inspection system could disclose such violations with a sufficient degree of certainty. International disputes over vital political and economic issues would, in any event, be likely to lead to the resumption of a hectic arms race and, in the final analysis, military power and technology would still decide the outcome.

A system more conducive to nuclear stability might be one permitting each of the major powers to retain a substantial number of retaliatory weapons systems that would be relatively secure from attack, but of an accuracy and destructive power suiting them more to a retaliatory mission than to destruction of an adversary's strategic power in a surprise attack. The surreptitious addition of even several hundred nuclear weapons to a potential aggressor's arsenals might not then upset the system, and attempts to overcome it would require efforts so great as to run a high risk of detection. Serious problems of sanctions to enforce the system, and means of preserving the security of nonnuclear powers under it, would, however, remain.

It is highly unlikely that any "foolproof" arms control and inspection system can be devised or that absolute stability is attainable by the most strenuous of efforts in this direction. But there are sound reasons for believing that it is in the interest of the United States, the Soviet Union, and other members of the world community to achieve as high a degree of nuclear stability as possible in the next decade.

D. THE DEVELOPMENT OF DETERRENT AND COUNTERDETERRENT STRATEGIES

The American strategy of nuclear deterrence, a broad reliance on strategic nuclear power for the support of foreign policy, evolved initially as a response to the specific threat of a direct Soviet attack upon this country. For this purpose there was no alternative to nuclear deterrence once the Soviets became armed with weapons against which there was no effective defense.

For reasons both economic and military, this strategy was later extended to deter the older threat of Communist conventional aggression against the free world. In this form it became known as a strategy of "massive retaliation" and capitalized on bonus effects

derived from the existence of a powerful strategic force. But the capacity for nuclear retaliation was to remain no more a U.S. monopoly than had nuclear weapons themselves. A growing Soviet strategic force had the counterdeterrent effect of restricting our freedom to retaliate and, correspondingly, diminished the deterrent value of threatening to use our strategic arm against aggression other than on the strategic forces of the United States.

The nuclear guarantee has been implicitly withdrawn from certain peripheral areas but the problem remains of how best to defend those areas where the interests of the United States are not peripheral and our prestige commitments are heavy. Here, particularly in the case of the NATO countries, no satisfactory alternative to nuclear deterrence has yet been developed.

E. THE CRISIS OF STRATEGIC NUCLEAR DETERRENCE

Increasing Soviet strategic capabilities are reducing the deterrent value of U.S. strategic nuclear power.

The possibility of a Soviet surprise attack on the United States cannot be ruled out as long as the American retaliatory force, composed predominantly of manned bombers on unhardened, immobile, and unconcealed bases, remains extremely vulnerable to a missile attack. While the Soviets may never achieve an assured ability to knock out SAC, conceivably they might prefer someday to risk the damage a crippled SAC could inflict on them rather than to risk the dangers of not striking first at the American strategic force.

Even during the period of its great vulnerability, American retaliatory power retains considerable deterrent value because of the uncertainties discouraging a Soviet first strike. However, American security must remain precarious unless SAC's present vulnerability is remedied within a short period of time.

While a rational first strike would have to concentrate on the enemy's strategic forces in order to minimize the extent of damage from enemy retaliation, the target strategy of the second (or retaliatory) strike may be more flexible. However, for the increased credibility of the deterrent and, if deterrence fails, for maximum military usefulness the second strike should give as much priority to military targets as conditions permit.

If and when both the United States and the Soviet Union achieve relatively invulnerable strategic forces capable of devastating second-strike retaliation, the strategic equation will become more stable, though only as long as these capabilities are preserved. Under such a stalemate on the strategic level, neither side can consider its strategic forces as rational instruments of attack or of strategic intervention. Therefore, if the United States and its allies accept the probability and desirability of a strategic stalemate that would reduce the risks of total war, they must provide an alternative to the threat of American strategic intervention as a deterrent against Communist nonnuclear aggression overseas.

America's allies are not in any greater danger of a Soviet nuclear attack than is the United States, because in bypassing SAC the Soviets would be exposing themselves to American retaliation with a strategic force at its full pre-hostilities strength. At the other end of the

spectrum of conceivable forms of Sino-Soviet aggression, with regard to the "peripheral" cases, the threat of American strategic intervention is not a credible deterrent. However, in this area, considerable protection is assured by existing local forces.

The greatest dangers lie in the "middle ground" of provocations, between peripheral and nuclear aggression. The threat of retaliation by independent allied strategic forces would be a poor substitute for SAC's diminishing deterrent against this realm of lesser aggressions, because a threat of ineffective city-busting by these forces—if put into effect—would invoke such self-destruction that the threat would lack credibility. Another expedient, heavy reliance on tactical nuclear weapons, cannot be expected to compensate for the numerical inferiority of local forces against Soviet armies also equipped with these weapons. Moreover, the initiation of tactical nuclear war by "battlefield countries" in response to *nonnuclear* attack assumes their willingness to bring about their own devastation. Nevertheless, local forces should be equipped and trained with these weapons in order to deter the Soviets from initiating their use. At the same time, the conventional capabilities of American and allied local forces and readily available reserves should be great enough to deter or hold against any attack the Soviets might consider sufficiently limited not to provoke American strategic intervention.

If highly invulnerable and reliable retaliatory forces can provide a deterrent against Soviet strategic strikes and if strong local forces can deter or stop nonstrategic aggression, it cannot be concluded that all efforts to maintain or acquire abilities to hit Soviet strategic targets ("counterforce capabilities") should be abandoned. Although the goal of effective first-strike counterforce capability to support the threat of strategic intervention may prove impractical and—in view of strategic instabilities—undesirable, a measure of counterforce striking power will be necessary if the United States is to be able, first, to fight wars effectively should deterrence fail; second, to make a retaliatory strike militarily useful; third, to keep abreast in the technological race; and, finally—perhaps—to force the Soviet Union to divert efforts toward the protection of its strategic force that would otherwise be available for increasing its first-strike counterforce capabilities.

II. RECOMMENDATIONS

This study suggests a number of revisions in the direction and emphasis of U.S. military policy. It stresses the desirability of adhering to the generally established purposes of American grand strategy (as presented in Part A), and the necessary continued importance of the essential military requirements of that strategy (discussed in Part B) among other requirements and objectives of American foreign policy.

In the light of past and foreseeable technological developments in the military field (covered in Part C) and in view of the strategic problems facing the United States and its allies (reviewed in Part C, chapters 5 and 6, and Parts D and E), the following measures are recommended for consideration. It should be noted, however, that this report is restricted to a specific subject matter and therefore does not include a full analysis of factors other than military technology affecting or supporting the attainment of our foreign policy objectives; nor does it include an analysis of budget levels within which such recommended courses of action, if adopted, would have to be fitted and tailored. The following recommendations therefore can only indicate shifts in direction and priority, the desirability of which is indicated by developments in military technology. Firm decision on the actual program to be carred out can only be made after taking into account all the other factors which the limited scope of this report has of necessity excluded from adequate exposition.

1. Because a high degree of security for the American strategic force with all its components is essential for the deterrence of a Soviet first strike or strategic surprise attack on the free world, including the continental United States, top priority should be given and increased and timely efforts should be made to reduce the vulnerability of American and allied strategic forces. Such measures should include the protection of airbases, bombers, control centers, missile launching sites and personnel through increased mobility, concealment, hardening, and dispersal.

Continued efforts should also be made to improve delivery systems and penetration devices that would enable even a retaliatory force that has been greatly reduced by an enemy strike to reach its targets. Measures appropriate to this purpose would include refinements in countermeasure systems and other tools of electronic warfare, improvements of penetration tactics, and the development of long-range air-launched ballistic missiles for use against air defense installations and other protected targets.

2. Because stopgap protective expedients, however necessary for the maintenance of a credible deterrent in the early 1960's, cannot offset the increasing vulnerability of manned bombers to surprise attack by ballistic missiles, and because the early liquid fuel intercontinental missiles, Atlas and Titan, are not sufficient in the security of their sites, in the speed of their reactions, or in presently planned numbers

to provide the United States with an adequate deterrent posture in the mid-1960's and beyond, a most strenuous effort should be made to accelerate the development of solid fuel ICBM's amenable in their size, weight, and mechanical simplicity to both large-scale production and mobile siting. A corresponding and simultaneous effort should be made to perfect hardened missile facilities on land as well as mobile land, air, and sea-based missile systems.

3. The overriding objective of such a strategic weapons program should not be that of "matching" assumed Soviet capabilities in numbers of ICBM's, but, instead, the early attainment of such an inventory of diverse and relatively secure retaliatory systems that the potential aggressor could not have confidence in his ability to locate and destroy a sufficiently high proportion of them to risk launching a surprise attack.

Although the continued American maintenance of a strategic force capable, in a first strike, of reducing Soviet strategic retaliation to a tolerable level will become increasingly more difficult and even undesirable for reasons of strategic stability, the United States should retain a measure of counterforce ability sufficient for rational target selection in a retaliatory strike, as well as for limited war capabilities and other purposes.

4. In view of the diminishing deterrent value of the U.S. strategic force with respect to a broad area of lesser aggressions, ranging from subversion and invasion-by-proxy to very substantial "conventional" attacks on overseas free countries, greatly increased American and allied efforts should be devoted to the strengthening of an alternative to U.S. strategic deterrence.

5. Because independent allied strategic forces can add little to the deterrent supplied by the U.S. strategic force and because they tend to divert allied efforts from more pressing needs of local defense, the United States should discourage the establishment or extension of independent nuclear forces. If our allies cannot be dissuaded from this objective, the United States should attempt to channel their efforts into mobile or otherwise protected retaliatory systems. For this purpose, it would be useful for the United States to share technical information concerning the construction of hardened missile sites and solid missile propellants with its allies.

6. The equipment of American and allied troops with weapons appropriate to tactical nuclear warfare, though necessary in order to deter the Soviets from resorting to tactical nuclear war, should not be treated as a substitute for the establishment of adequate nonnuclear forces, for two reasons: first, dependence on nuclear weapons, even though tactical, exposes the "battlefield countries" to great devastation if war should occur; and, secondly, such weapons will not compensate for the numerical inferiority of the troops employing them against forces similarly armed.

Instead, the United States should increase the strength of its nonnuclear capabilities and maintain adequate levels of dual-purpose forces to protect its overseas interests. At the same time, it should encourage its allies to give priority to a program of building up nonstrategic dual-purpose forces that would be able, with American support, to deter or stop such attacks as the Soviets would dare to launch

in view of the ceiling on large-scale aggression that the threat of American strategic intervention continues to provide.

7. Because space technology offers one of the few areas in which the development of a new weapons generation may be possible, the United States should not permit the Soviet Union to outdistance its own achievements in this field. The United States should seek as a first requirement the development of a powerplant with sufficient thrust and reliability to provide a range of choice as to the weight and trajectory of the instruments that can be launched into space. Major space efforts should continue as a part of American defense policy, unless at some future date it becomes apparent that the military implications of space are negligible.

8. On the assumption that steps will be taken to create a workable alternative to U.S. strategic deterrence of the less provocative forms of Sino-Soviet aggression, the United States should pursue a policy aimed at increasing the stability of the strategic equation by unilateral action, by the encouragement of reciprocal action, and by an arms control policy directed at strategic stability.

In addition to increasing the security of its own retaliatory forces, the United States should avoid such sources of instability as the deployment of highly vulnerable strategic missile systems in the territory of nations proximate to the Communist bloc. It should continue to avoid any reliance on "hair trigger" response mechanisms that may be conducive to war by accident. Other nations should be encouraged to avoid similar sources of instability.

Arms control policy should not aim for total nuclear disarmament which would permit a violator to gain supremacy through the surreptitious production of relatively few weapons. Instead, strategic forces should be limited to retaliatory systems capable of surviving a first strike, though insufficient for employment in a first strike.

III. BODY OF THE REPORT

Part A. General Introduction—U.S. Purposes in World Affairs and U.S. National Strategy

There is general acceptance of the proposition that military forces exist for the purpose of supporting the Nation's policy and not vice versa. There is also general agreement that military technology has an immensely important bearing on the matter and limits within which military forces can support national policy and on the threats that enemy military forces can present to national policy. It is the purpose of this study to discuss the interrelationship of foreign policy and military technology in greater detail.

It is useful, by way of introduction, to state certain assumptions as to the purpose and objectives of U.S. foreign policy on which the subsequent discussion is based.

The fundamental purpose of the United States is laid down in the Constitution. It is:

> * * * to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity * * *.

The object of our foreign policy derives from this purpose. It is to promote and secure conditions in the world under which a nation, with such purposes as ours, can live and prosper.

We assume that the lesson of the two World Wars and of the postwar world is that the United States has become too important a factor in the world to be concerned merely with its narrow national interests in a world system the nature of which is to be left largely to the responsibility and will of other nations. In other words, our position is now such that we must bear a major share of responsibility for the creation and maintenance of a structure of world relationships compatible with our development as the Nation we are and believe ourselves capable of becoming.

A few words of expansion of this point may be appropriate.

One possible viewpoint in considering the aims of U.S. foreign policy is to emphasize U.S. interests, U.S. security, and the direct threat to that security posed by the hostile power and intentions of the Soviet-Chinese Communist bloc. From this point of view, allies are important to us only because of the contribution they can make to our interests and our security, and the object of our foreign policy is basically defensive. It is to keep the Russians and Chinese Communists and those whom they control from expanding into areas that would threaten our direct interests and our security as a nation.

The alternative is to regard U.S. interests and U.S. security as directly dependent upon the creation of some form of world order compatible with our values and interests. The establishment and maintenance of such a system calls for a protracted and creative

effort on the part of the United States—an effort including, but going beyond, mere holding operations against Communist encroachment. From this viewpoint, the object of policy is focused more directly on what it is we are trying to construct, and to defend while we are constructing it, rather than merely upon reaction to Communist encroachments.

From this second point of view, it is useful to take a brief look at the last preceding historical period during which a considerable degree of world order and stability existed.

The century from 1815 to 1914 was such a period. During those 100 years the balance of power among the European states operated to preserve a large measure of international stability. No single power could realistically aspire to dominate the world. England, with firm control of the seas, acted as a check on the ambitions of any of the land powers. England was not strong enough and did not aspire to dominate the European Continent. She acted as a balance wheel to preserve the balance of power between the European continental land empires. No nation outside of Europe had the command of modern technology or an industrial base sufficient to make plausible a general challenge to European leadership. Economic institutions based on the gold standard and centered on the London capital market provided an economic framework within which large portions of the world, including the United States, were able to make tremendous forward strides in developing their economies. The principles of the common law and of political institutions based on the notion of public responsibility began to spread out to the far corners of the world. Above all, wars up to 1914 were kept limited in their geographic extent and in the objectives of the participants.

The two World Wars and the progress and spread of modern technology shattered this system. The balance of power in Europe, and the very empires on which it depended, were destroyed. The power of England was weakened. The significance of sea power was diminished by modern weapons systems of great range and potentially overpowering destructiveness. The primacy of the European powers was cast in doubt. A strong United States and a bitterly hostile Russia came to the fore.

From the second point of view, the fundamental issue in the international arena is not merely that of U.S. security; it is the question of who will be the builder of a new international order, appropriate to today's world, to take the place of the one that was shattered in the two World Wars. Since 1946, we have been trying to resolve that question, whether or not we have always been fully conscious of it, by contesting with the Soviet Union and its allies whether it would be they, or we and our allies, who would succeed in constructing such a new system.

What are the main elements of the structure we have been trying to erect since 1946, and to defend while it was being erected?

This new structure had to have its political, its economic, and its military parts. It had to provide for certain worldwide functions. It had to foster closer regional institutions within the worldwide system. A unique role in this system had continuously to be borne by the United States because we alone had the resources and the will to tackle the job. And it had to be constantly defended against the hos-

tile and destructive efforts of the Soviet-Chinese Communist bloc which was dedicated to the construction of quite another system.

An important part of the structure was its economic sector. This had its worldwide aspects geared into the United Nations structure. The International Monetary Fund provided an institution looking toward greater stability of the world's currencies necessary for the financing of the world's commerce. The International Bank for Reconstruction and Development was to provide a pool of capital to flow to those areas needing capital and able to make sound use of it. The arrangements under GATT, the General Agreement on Trade and Tariffs, were to move toward the reduction of administrative barriers to international trade. These international institutions were reinforced by regional and bilateral actions such as the Marshall plan, the Organization for European Economic Cooperation, the European Payments Union, the technical assistance program, and the Colombo Plan. We supported these international, regional, and bilateral approaches through U.S. economic policies generally consistent with our new role as the world's leading creditor nation and its principal reservoir of capital and of technology.

In the military sphere a similar structure compounded of international, regional, and individual arrangements had to be gotten underway. The heart of these military arrangements had to be strength at the center, strength in the United States itself. Supplementing U.S. strength at the center, an immense effort has gone into building strength at the periphery, through the Organization of American States, the North Atlantic Treaty Organization, the Southeast Asia Treaty Organization, through the mutual defense assistance program, and through our bilateral arrangements with the Republic of Korea, the Chinese Nationalists, and Japan. Much of the non-Communist world was tied together through a system of alliances. Even those parts of the free world outside the alliance system were given a substantial measure of protection through the strengthening of world acceptance of the principle of restraint against the use of aggressive military force—and our active support of that principle.

These economic and military measures have found their place within a political structure, the broadest aspect of which was the United Nations Organization, but the heart and driving spirit of which has been U.S. responsibility. A pattern of political relationships emerged, characterized by exceptionally close collaboration between the United States, England, and Canada, spreading out through close, but not as close, relationships with France, Germany, Italy, and Japan, and shading off to cooperation on certain basic matters with uncommitteed but free countries such as India and Burma.

The object has been to create a structure sufficiently flexible in its arrangements and sufficiently dynamic to house the diverse interests and requirements of the entire non-Communist world. Even with respect to the Communist world it was hoped that the structure would have something to offer and would, by its attractive power, either give room for maneuver and draw off portions of the Communist world, as it did in the case of Yugoslavia, or result in a weakening of the bonds within the Communist world, as it did in the case of Poland but failed to do in the case of Communist China.

This broad view of the purpose and aims of U.S. foreign policy, and of the range and scope of the objectives and programs which it implied, did not come into being all at once.

At the end of World War II, the great majority of Americans were awake to the fact that the United States had new responsibilities in the wake of victory in that war. They did not then have in mind a narrow pursuit of national interests or of security. They wished their leaders to lay the foundations of a new order that was compatible with the basic interests of free people everywhere. It was in this spirit that the United States took the initiative in establishing the United Nations, sought to assure the right of free elections and democratic institutions for the peoples of Eastern Europe, sought prompt and generous peace treaties to restore the defeated nations to the world community and put its influence behind the early emergence of the colonial peoples to self-government. These policies were urged on their merits and not as a mere reaction to what later came to be recognized as the threat of Soviet and Communist hostilities and expansionism. In fact, it was originally expected by many, and hoped by nearly all, that the great victors of the war, especially the United States and the Soviet Union, would be able to continue their wartime cooperation into the peace and keep their wartime enemies or any new aggressive powers from disturbing that peace.

The prompt and uncompromising demonstration by the Soviet leaders, however, that they had no intention of continuing such cooperation and were in fact set upon establishing a world order of their own, an order diametrically opposed to any concept of justice and equity understandable to us, radically changed not the American purpose, but the character of the grand strategy by which it now had to be pursued. The cold war arose in a clash between two antagonistic and, so far at least, incompatible views as to how the world was to be shaped. It developed into a struggle in which the survival not only of the United States, but of the free world as well, was at stake.

There was, thereafter, no longer a valid place for the utopian view that all the United States had to do was to suggest organizational and political arrangements designed to be compatible with the basic interests of free peoples everywhere and then give a shining example of its own disinterestedness by demobilizing its military forces and those economic and political instruments by which its power could be effectively brought to bear as a discriminating tool of policy. It soon became evident that quite another strategy was called for. All the means of influence and power, military forces, as well as the economic, ideological, and moral strength not only of ourselves but of all those other nations in the world who saw the problem as we did, had to be mobilized and thrown into the contest. The important place that had to be given to military policy and power—which will be discussed below in Part B and in subsequent chapters of this report—came as a shock to many at home and has been exploited abroad to create the false image of a militaristic America.

The necessities of defense against the grave threat of Soviet and Communist expansionism forced the United States to modify the character of its relations with the nations of the free world. Persistent Soviet use of the veto destroyed the potential utility of the United Nations Security Council as a body competent to determine

violations of the charter and to command appropriate collective corrective action. The United States had to modify its original hope that it could pursue its security and other political interests within the United Nations framework and restrict its non-U.N. actions to peaceful collaboration with all nations looking toward economic and cultural reconstruction and development. Instead, alliances for collective defense had to be established with allies often chosen, not because their institutions and values corresponded with those of the United States, but because of the contribution they could make to the cause of common defense.

These developments occurred, moreover, at the very time the world was entering the nuclear age. At first, the full impact of this circumstance was obscured by the fact that the United States enjoyed a monopoly of nuclear weapons. It was always recognized that that monopoly would be temporary. It was presumed, however, that the United States possessed a technological edge that could be expected to give it a possibly commanding strategic advantage over the Soviet bloc for an indefinite period.

Serious problems of relating military force to our policy and strategy arose even during the period of our atomic monopoly. As stated earlier, there had been no basic shift in our basic objective of creating and maintaining a compatible structure of world order. Our national strategy had had to be amended concurrently to take account of the reality of Soviet hostility and intransigence. The problem which we faced in the realm of military policy and strategy was therefore twofold. On the one hand, we had to have the military forces appropriate to back up with force and authority the principles and standards of international behavior implied by that system of world order that we and the free world, supporting the United Nations Charter, were attempting to work out. On the other hand, we had to have military forces adequate to balance the military power of the Soviet Union and its associates. The first function of military force was somewhat analogous, in the international field, to the police power in the domestic field. Police power to be effective should be unchallengeable, should be coupled with a high degree of community consent determined through accepted procedures, and should be of a kind that restrains the culprit but does not destroy the community. The second function of our military forces, that of balancing Soviet military capabilities, implied a capability of influencing the choices open to those directing the Soviet Union so that Soviet military forces would not be used, or of destroying those forces should deterrence fail.

During the period of our atomic monopoly, it appeared that our conventional forces should be adequate for the first function and that the added weight given by our atomic capability should make our military forces as a whole adequate for the second function. It soon became evident, however, that most of the issues deemed by us to involve a violation of the principles of the U.N. Charter and therefore to call for collective corrective action would be challenged by the Soviet bloc. The two military strategic problems therefore appeared to coalesce into one problem. If this were so, then the weapons and forces appropriate to one function should be appropriate to the other. That this is not entirely true has become evident every time we have actually had to face issues involving the use of military force but

not involving the actual commitment of full Soviet military capabilities. Atomic weapons, and *a fortiori* large thermonuclear weapons, have not been deemed to be appropriate in any such situations as have arisen in the past, viz, Korea, Indochina, Suez, and Quemoy.

Obviously the difficulty of finding an appropriate military posture to support the complex objectives of our foreign policy increased after the ending of our atomic monopoly and the rapid further strides made by Soviet military technology.

To many it seemed that the military, financial, and psychological burdens which our foreign policy entailed were excessive. It is hardly astonishing, therefore, that some came to despair of the possibility or desirability of the course on which the country had engaged itself, a course that in their minds would overextend the resources of the United States and could lead to disaster.

One group advocated retrenchment, a policy of Fortress America, by which the United States would disengage itself from commitments to preserve the independence of nations on or close to the Eurasian land mass; a second group more or less openly toyed with a leap forward into preventive war which would put an early end to the struggle by removing from the hands of those who opposed us the instruments of military power. The bulk of the American people have stood against such advice.

Withdrawal to the Western Hemisphere would place the rest of the world at the mercy of the Soviets and turn the United States into an isolated island in a sea of communism; a preventive war would violate the very principles on which the United States is seeking to base a new order and would alienate the very forces in the world whose cooperation is imperative if progress toward such an order is to be accomplished. Both policies would run counter to the idea of responsible leadership as understood in this country.

Thus, if we do not propose to accommodate to Soviet ideas of world order and until such time as the Soviets recognize at least certain basic principles of equity, of justice, and of mutual interest, there appears to be no escape from continuing to support our national policy as it has evolved since World War II, in spite of its complexity, burdens and risks.

The balance of this study will deal more precisely with our evolving military problem in supporting that national policy and with the impact on that problem of evolving military technology.

Part B. U.S. Interests and Foreign Commitments Governing U.S. Defense Policy

Chapter 1. U.S. Foreign Policy in the Context of the Cold War

A. THE ROLE OF DEFENSE

For a country such as the United States, engaged in a bitter struggle with the Sino-Soviet bloc for which no solution on acceptable terms is presently in sight, the task of preserving and protecting its cherished values against a powerful opponent occupies a key place in its foreign policy. In many respects, such external activities as commercial policy, economic aid or support of the United Nations have had to be subordinated to the requirements of defense and, indeed, turned into instruments of an all-embracing cold war policy. This policy transcends the purely military field, and thus the realm in which military power and its technological component come into play directly. Activities such as propaganda and economic assistance complement the measures aimed at military power and prestige both by establishing and cementing bonds of alliance and friendship and by weakening unity and morale in the adversary's camp.

Some fear has been expressed that concern for such nonmilitary policies may suffer by an excessive preoccupation with military defense. The United States is being criticized, especially abroad, for what many regard as an unwarranted emphasis on military affairs. The immediate Soviet threat, it is argued, lies in expansion through subversion or "indirect aggression." This may be true today or become true in the future. But the critics overlook the possibilities that the Soviets can shift to military action at any moment—as Red China has done more than once—and, moreover, that the Communists' abstention from resort to military force may reflect no other inhibitions than their respect for U.S. and allied military counterpower. After all, despite success in China where indigenous Communist armies could do the job of communization and in Czechoslovakia which was virtually surrounded by Soviet armies, the Soviet Union has found no satisfactory substitute for the march of its armies that turned a score of Eastern European nations into Moscow's satellites.

Therefore, as long as the United States and its friends are as seriously threatened by powerful opponents as they are today, military policy will, of bitter necessity, remain at the heart of American foreign policy, so that the success of America's national grand strategy will depend to a large extent on high achievement in the field of military technology and on high quality of strategic thought.

B. THE POLICY OF "GOING IT WITH OTHERS" AND ITS EFFECTS ON THE U.S. DEFENSE PERIMETER

In the short period of years that extended from the Japanese attack on Pearl Harbor to the signing of the NATO pact, U.S. foreign policy successively underwent two marked shifts, the first more spectacular but not more far-reaching in its consequences than the second.

At the time when the United States joined the United Nations, the traditional American policy of "going it alone"—usually referred to as isolationism—gave way to a policy of "going it with others," even in peacetime. This first break with long-established tradition reflected a conviction, shared by most Americans, that two World Wars might have been avoided if, prior to the outbreak of hostilities, the United States had cooperated with other states to preserve the peace of the world.

Collaboration within the framework of the U.N. was not likely, however, to have much bearing upon American defense policy and military requirements. "Police action" against a country condemned as an aggressor, as called for by the collective security provisions of the Charter in cases in which the deterrent effects of the system failed, might demand military action by the United States that would otherwise not have been undertaken. But since this action was predicated on the assumption that all the great powers victorious in World War II would be ranged on the side of the "police," the potential aggressors could only be minor powers or the disarmed members of the former Axis coalition. The rapid and far-reaching demobilization of American military forces at the close of the war was not inconsistent, therefore, with membership in an international organization dedicated to the task of "collective security."

The second shift in policy, leading to the creation of a farflung "collective defense system," was to revolutionize the defense picture in the direction of unprecedented demands on U.S. military preparedness and American military strategy. It came about when the assumed solidarity and cooperation between the victors, especially between what had come to be the recognized two leaders or superpowers among the nations of the world, gave way to the "cold war" or "East-West struggle." Confronted with a hostile, expansionist, and dynamic Communist power bloc of rapidly expanding industrial and military might, the United States was quick to realize that it could not meet these new threats to world security either by reliance on its own resources alone or by reliance on the United Nations for support against adversaries who were also members of the world organization. What emerged, therefore, was an alliance policy [1] by which the United States agreed with a large body of nations to participate in common defense measures directed specifically against threats that could come only from the Sino-Soviet bloc. While the collective security commitments under the U.N. Charter continued to stand, the requirements of collective defense now became the standard by which American military preparedness had to be measured and judged.

The military policy that gradually emerged as the U.S. response to the dangers of the cold war bears many significant features, the most

[1] The terms alliance and collective defense are used here synonymously and very broadly to cover all forms of alignments.

striking of which is its collaborative aspect that stands in such sharp contrast to earlier condemnations of "entangling alliances":

1. It was to be a policy of response to attack rather than of offensive military action, its chief objective being to prevent further Sino-Soviet expansion. The term "containment" remains appropriate for the objective insofar as military policy is concerned, because at no time was it intended that the Iron and Bamboo Curtains be rolled back by the force of arms. Some critics have condemned the policy as too defensive, though it can be pointed out that, translated into military requirements, such "mere defense" turns out to be an extremely ambitious and exacting task.

2. It was to be a policy seeking and welcoming the cooperation of any nation that was prepared to join the United States in a collective defense effort. While most potential allies were almost devoid of military power at the beginning of the cold war, it was assumed that with American assistance, their resources in men and materials and the geographical location of their territories would develop into substantial and, in fact, indispensable assets in the struggle for containment.

3. Finally, as time passed, the area under American protection—or within the American defense perimeter—was extended to include practically all areas not already engulfed by the Sino-Soviet flood and held behind the Iron and Bamboo Curtains. At the least, the expectation became justified that the United States would not remain passive if a military attack from the Soviet bloc occurred against any but the most remote parts of the non-Communist world. Undoubtedly, these offers of American assistance were motivated in many cases by a genuine American identification with the desires of these countries to preserve their freedom against Soviet encroachment. In the case of Western Europe, such an identification may have been strong enough in itself, aside from any concern for American national security, to offset any isolationist inclinations toward a strategy of Fortress America. But for an explanation of the extension of the defense perimeter to the four corners of the world and to the exposed borders of countries that are neither willing nor able to make any serious contribution to the collective defense effort, a further explanation can be found in the geopolitical situation.

Ever since the surrender of the Axis coalition, the world, in geopolitical terms, has been characterized by a threefold division: (1) A formidable power center in the heartland of Eurasia, extended later to the China Sea; (2) a ring of exposed and relatively weak countries on the rimlands of Eurasia and on neighboring islands, stretching along the 20,000-mile periphery of the Soviet bloc; and (3) another power grouping centering on the United States and located on the opposite shores of the great oceans, many thousands of miles from th danger zones of Eurasia. If U.S. survival as a free country, no less than the survival of the other non-Sovietized nations, depended on a reasonable balance of world power, it was necessary to find ways to prevent Soviet expansion into the exposed and less well-defended rimland area, a catastrophe that would destroy beyond repair the existing but tenuous world balance. The only solution was an American policy of containment that brought American power to bear on the overseas areas of Eurasia where Soviet expansion was otherwise likely to occur.

This vital American interest in preserving or restoring the world balance explains why the mantle of protection is not, and cannot be, limited to countries able to contribute to collective defense or even to countries eager to obtain protection. To the extent to which the loss of any territory threatens to upset the balance, American vital defense interests are involved. It does not follow that the entire territorial status quo along the Iron and Bamboo Curtains has become sacrosanct. Not every change in favor of the Soviets need in itself be so detrimental to the balance of power to warrant the risks and sacrifices of war. Yet, by a kind of vicious circle from which there may be no escape, the failure of the United States and its allies effectively to assist any country willing to stand up in the face of Soviet threats may tend to undermine the collective defense system as a whole and thus to tip the balance dangerously in the direction of the Soviets. This possibility is often referred to as the "domino effect," by which other vulnerable countries will lose confidence in American guarantees and collective defense and give up their struggle to remain free. On this basis, a military stature is required that conforms with the demands of a defense perimeter coinciding roughly with the present recognized borders of the Sino-Soviet bloc. The implications of this belief have been demonstrated in such distant places as Quemoy, Lebanon, and West Berlin, with the last of these, though an enclave inside the Soviet bloc, enjoying the same claim to collective protection as if it were an ally of the United States and other countries of the West.

Chapter 2. The Scope of U.S. Foreign Military Commitments

A. COLLECTIVE SECURITY AND COLLECTIVE DEFENSE

The policy of containment, conceived as a collective effort, has evolved gradually through a succession of bilateral and multilateral agreements which, in the case of the Truman doctrine, the Eisenhower doctrine, and the Protocol to the Manila Pact, are supplemented by unilateral commitments of military support under certain prescribed conditions. There has thus come into being a global network of American commitments, varying in their implications for American military requirements by differences both in the scope of the American commitment and in the degree of reciprocity pledged by the countries in question.

Not all the commitments entered upon by the United States are limited to defense against armed attack or military aggression by members of the Soviet bloc. Some are directed against aggression from any quarter, and some specifically include defense against "indirect aggression" by Communist countries. Within this latter category of American commitments not clearly directed against armed attack by Soviet bloc members are the following:

Membership in the U.N. carries with it at least a moral obligation to participate in military action against any country anywhere that has been condemned for aggression by the U.N., in cases in which either the Security Council or the General Assembly recommends such action. In addition, according to official statements of the Eisenhower administration, the United States might on occasion go further and consider itself legally justified and morally bound to

take "police action" against an aggressor in conformity with the principles of the Charter, even if no organ of the U.N. recommended such action.

Secondly, the Rio Pact, a kind of regional collective security system for the Americas, is also not reserved for action within the context of the cold war. Instead, the pact commits the United States, as well as its 20 other members, to consider any attack against an American state as being an attack on all American states.

Thirdly, the Middle East resolution, or Eisenhower doctrine, commits the United States to use its Armed Forces at the request of any country in the Middle East against armed aggression from "any country controlled by international communism." Here, the aggressor might not belong to the Sino-Soviet bloc, though presumably it would have the backing of the bloc or be acting as its agent.

Finally, what has come to be known as the Truman doctrine, enunciated in a speech President Truman delivered to Congress on March 2, 1947, declares it to be the policy of the United States "to support free peoples who are resisting attempted subjugation by armed minorities or by outside pressures." While such support is to be primarily economic and financial, a promise of military assistance, should it prove necessary against what is now usually called indirect aggression, can be and has been read into the declaration.

Though not insignificant in their bearing on American foreign policy, none of the commitments under the four headings listed above is likely to make any significant demands on American military power and preparedness for assistance against an aggressor that is not a member of or backed by the Sino-Soviet bloc. In all probability, the military forces ordinarily available to the United States would be sufficient for "police action" against any non-Communist country, whether inside or outside the Western Hemisphere and whether the action were taken by the United States alone or—which would seem much more likely—in cooperation with others.

In contrast, the following series of collective defense agreements and commitments directed unmistakably, though as a rule not explicitly, against the Sino-Soviet bloc will be found to pose very serious military problems for the United States:

The first such collective defense agreement with overseas countries entered into by the United States—and Canada—was the North Atlantic Treaty which established NATO. It continues to overshadow all others both in its military implications and its political significance. Like the Rio Treaty, it requires its 15 signatories to regard "an armed attack against one or more of them" in Europe or North America as an attack against all of them. By article 5 of the treaty, the members are committed to "assist the Party or Parties so attacked by taking forthwith, individually and in concert with the other Parties, such action as it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area." While the United States, like all other members, is free to use its own judgment in deciding what action is necessary to achieve the stated objective, the United States acting in good faith can meet its legal obligation under this provision only by maintaining and putting into action, in case of an attack on any part of the NATO area,

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armed forces sufficient to ward off the attack. In no other way could it hope to "restore and maintain the security" of the area. None of the subsequent collective defense agreements contains any similarly stringent military commitment, though they have implications, too, for the defense tasks resting on the American Military Establishment.

Through NATO, all non-Communist countries of Europe bordering on the Soviet Union and thus directly exposed to Soviet encroachment—with the exception of Finland, Sweden, and Austria—are assured, by treaty, of U.S. military support against armed attack from behind the Iron Curtain. Sweden, as well as the two not directly vulnerable countries, Switzerland and Eire, have chosen to trust their security to a policy of neutrality; Finland and Austria had no other choice but to do so.

After the Korean war the United States set out to fill the military power vacuum in Asia, first in the Far East, and subsequently in southeast Asia and the Middle East.

In 1951, in quick succession, defense agreements were signed with Japan, then with the Philippines, finally with Australia and New Zealand (the ANZUS Pact), followed in 1953 by a "treaty of mutual defense" with the Republic of Korea and by a similiar treaty in 1954 with the Republic of China. All of these pacts differ from NATO and the Rio Pact by the fact that an attack on one of the parties is to be regarded by their members not as an "attack against them all," but as a "danger to their own peace and safety." The treaties call upon the parties to consult with one another and to take action, unspecified in character, by which to meet the common danger. The Japanese treaty gives the United States permission to dispose land, air, and sea forces in and about Japan by which "to contribute to the maintenance of international peace and security in the Far East and to the security of Japan against armed attack."

In the wake of the French defeat in Indochina, the collective defense network was further extended to cover the area of southeast Asia. The United States, Britain, France, Pakistan, the Philippines, Australia, New Zealand, and Thailand signed the Manila Pact (establishing SEATO), including in the area to be covered by their agreement the three nonmember nations of South Vietnam, Laos, and Cambodia. The commitment of the United States and of the other signatories was identical to that undertaken under the Far Eastern treaties listed above.

Thus, by the end of 1954, all but three non-Communist countries in eastern and southern Asia had been assured by formal treaties that the United States would consider an armed attack on their territory as a danger to its own security and would act to help them meet the common danger. While the character and extent of this help are not specified, the treaties themselves, as well as the military consultations and the military measures that have accompanied them, would justify expectations by the recipients of these U.S. promises of American military assistance if needed.

The three non-Communist countries in the area not covered by any treaty are India, Burma, and Indonesia, which have refused to be included within the U.S. defense perimeter in any specific manner beyond the universal American commitment against aggression contained in the U.N. Charter. However, because none of the three

has common frontiers with the Soviet Union and because they are separated from Red China by formidable though not insurmountable natural barriers, the most serious gap that remained in the ring of U.S. defense treaties and accompanying military arrangements was the extremely vulnerable Middle East.

Iran—as well as the Arab countries to the south—lying between Turkey, a member of NATO to the west, and Pakistan, a member of SEATO to the east—had until 1955 received no outside guarantees of security. In that year a multilateral security pact between the United Kingdom, Turkey, Iran, Iraq, and Pakistan was signed which, until the withdrawal of Iraq, was called the Baghdad Pact (establishing what is now called the Central Treaty Organization or CENTO). While the United States, for political reasons, did not join the organization itself, its participation in the deliberations of the military committee gave expression to the American military interest. Moreover, after Iraq dropped out in 1959 the United States entered into a bilateral pact with Iran committing itself, in the event of aggression against Iran, to take such appropriate action, including the use of armed force, as may be agreed upon or as envisaged under the Eisenhower doctrine, to assist Iran at its request.

In terms of legal as well as moral obligation, the containment ring was now closed. Whether it is closed in the sense of effective prevention of further Sino-Soviet expansion depends largely, though not exclusively, on the military power with which the United States and its allies are able and willing to back up their commitments. The effectiveness of nonmilitary means of defense, the strength and intentions of the Soviet bloc, and the defense contributions of the countries to which the United States has extended its promises of support are all factors determining the burden that rests on American military power as a consequence of the American collective defense network. But whatever these factors may do to lighten this burden, it is certain to be heavy and deserving of special attention.

B. MILITARY IMPLICATIONS OF U.S. DEFENSE POLICY

It would be seriously misleading to treat the demands on American military power arising from commitments to other states—exacting though they may be—as if they constituted merely a painful addition to the demands stemming from the needs of American self-defense. As mentioned earlier, the U.S. policy of "going it with others" does not stem from sheer generosity or dedication to the cause of freedom alone, though these are far from negligible codeterminants. Collective defense has become necessary for two reasons: first, because the survival of the United States as an independent country and the preservation of the American way of life would be gravely imperiled if Moscow and Peiping gained control over the whole of Eurasia; and, secondly, because neither the free countries of Eurasia by themselves, nor the United States alone, could in the long run hope to prevent this from happening.

The resulting collective defense policy has not been entirely in line, however, with the traditional form of a policy of alliances. The present situation is a peculiar one. In a sense, all American alliances, NATO included, are American guarantees undertaken for the pro-

tection of other states rather than pacts of mutual assistance, as alliances have traditionally been. The reason is simple and is as valid today as it was when the policy was started. At the time the United States adopted a policy of collective defense against the Soviets, the American homeland was practically invulnerable to any direct Soviet assault. American security was threatened only indirectly by way of Soviet conquest of other nations. Therefore, although only the Rio Pact and the North Atlantic Treaty, among all of the American collective defense pacts, commit their non-North American signatories to defend North America as well as their own territories, at the time both pacts were signed there was little danger of an attack on the United States or Canada.

Today the situation has been radically affected by the increased range, power, and accuracy of American and Soviet bombers and missiles. The United States and Canada have become vulnerable to attack by Soviet bombers and missiles and the vulnerability of the Soviet Union to attack by American strategic forces has become less dependent upon bases close to the periphery of the Soviet Union. A question has therefore arisen as to the contribution that our overseas allies can make to the collective defense of the Western alliance system. As time goes on, allied strategic nuclear power, which Britain possesses to a small extent already, may eventually supplement American strategic forces. It is difficult, however, to see how this form of allied assistance could gain anything like the importance that the American strategic contribution to the defense of its allies has today, and will probably continue to have in the future.

It remains true, nevertheless, that both on military and political grounds a policy of collective defense promises the United States a greater degree of security than does a policy of individual defense. From the military point of view, any increase in the number and variety of retaliatory systems that the attacker must take out in his initial counterforce blow decreases the confidence he can have in its decisiveness. More important, however, is the political factor. It is credible that the Soviet Union might, under certain circumstances, launch a counterforce attack against a single opponent, such as the United States, if the Soviet leaders were convinced that such an attack would achieve its objectives. It is much more difficult to believe that the Soviet Union would take on the worldwide political opprobrium that a general attack on a large number of countries would certainly entail. It therefore remains true, even in the light of present and predictable technological advances, that united we stand, divided we fall.

The military power of the United States and its allies must, however, meet two distinct requirements: it must be capable, first, of assuring the security of the alliance system against strategic nuclear attack, and, second, of protecting exposed overseas free world countries against a wide range of possible nonnuclear forms of aggression.

In the past, it was sometimes suggested that capabilities adequate for protection against nuclear attack would automatically fulfill the requirements of the second task as well. American retaliatory nuclear striking power, it was believed, would deter the Soviets not only from attacking with their strategic nuclear power but from any re-

sort to military force. If this assumption proves no longer to be tenable—if it ever was—then deterrence and defense preparations for the second task will be different than those required for the first. It would indeed have been almost a miracle if the adoption of broader security commitments—no longer confined to national self-defense in the narrow sense of the term but now aimed at containing Communist power on distant continents and along exposed land frontiers within Eurasia—would not have placed very serious additional and specific burdens on American military power.

How great these burdens are today, and are likely to become in the future, depends to a large extent on the military value of the efforts the overseas countries themselves are able and willing to make, whether for their own defense or for that of other members of the collective defense network. Many of them, as partners to multilateral defense treaties, are formally committed, like the United States, to come to the assistance of other potential victims of attacks even if these attacks do not hit them directly.

The total contribution of America's defense associates in local forces is far from negligible. Their ground forces alone have been estimated at around 200 divisions. While the United States has helped to equip and train these forces, these countries have carried a large part of the financial burden involved in their establishment and maintenance. To these local forces, which include air and naval units of considerable scope, must be added the military contribution that consists in the permission to station U.S. forces and installations on allied territory and to use this territory, if necessary, for the conduct of military operations. The importance of this last contribution can be appreciated in the light of the difficulties encountered by belligerents in past wars when neutral countries refused access to or passage across their territory.

C. NONMILITARY CONSIDERATIONS AFFECTING U.S. MILITARY POLICY

As long as the cold war lasts, the United States can have little hope of gaining a fair measure of security for itself and other free countries except by containing the Sino-Soviet bloc through a policy of collective defense that makes heavy demands on U.S. military strength. Yet, in addition to providing its allies and friends with enough military support to deter or to stop a Soviet attack, the United States as leader of the coalition must also take measures, including military measures, designed to hold its allies together in peacetime and to make its network of alignments a reliable instrument of policy.

Political and psychological factors may sometimes have to outweigh purely military considerations. On occasion it may be necessary to bolster the domestic prestige of a friendly regime by providing it with a military establishment that exceeds its collective defense needs, while in other cases allied solidarity may best be preserved through some form of nuclear sharing that, in American opinion, is not required for deterrence or defense. Or the United States may have to abandon an established or proposed airbase that, though strategically desirable, would place too much strain on a friendly government or would threaten its Western orientation. Again, certain strategic plans may have to be modified despite their military merit, because

they arouse neutralist sentiments in certain countries or provoke fear and antagonism in others. In all such cases, political and psychological stresses and strains within the alliance system raise the military price the United States must pay if it is to enjoy the benefits of an effective alliance policy.

Some of the most striking of the strains within the alliance system deserve brief mention here for they are relevant to the choice of weapons systems and strategies best suited to meet the needs of the United States and its allies.

Certain geographical factors adversely affect the relationship of the United States and the many overseas members of the free world. To bring its power to bear on the balance within the Eurasion danger zone, the United States must locate its military forces in overseas installations thousands of miles from the American continent and close to the Soviet Union. The United States exposes itself thereby to accusations of "militarism" and provocative behavior. Also, the presence of American forces within other sovereign states, which must consent to their establishment, inevitably raises tensions and resentments that are welcome fuel for the fires of Communist propaganda and domestic opposition protest. The difficulties thus created for the deployment of American forces in the manner from time to time considered wise by the United States are illustrated by the debate on IRBM launching sites in Europe and by the issue of disengagement.

American defense efforts are also complicated by the vastness of the American defense perimeter which stretches from one end of Eurasia to the other. Whenever a crisis calls for a concentration of American military strength at some point along the periphery of the Soviet bloc—in the Formosa Straits, the Middle East, or West Berlin—our allies and friends in other sections of the "front" are concerned both lest American power is being "diverted" to a faraway theater and lest they become involved in a war originating in spots remote from their sphere of interest. In view of such strains on the alliance system, the United States may find it necessary either to place limits on its military intervention at the crisis point or to increase its military presence in other sectors. In both cases, military risks or additional military requirements may arise from the need for increased political solidarity among the countries joined in collective defense.

The introduction of nuclear weapons has become another source of interallied tensions. This was not the case in the early years when the United States enjoyed its short-lived nuclear monopoly. On the contrary, at that time the new atomic weapons helped tighten the bonds between the country that was able to provide a protective nuclear umbrella and the beneficiaries of American protection which gained a sense of security without having to make a large defense effort of their own. But since the first Soviet sputnik dramatized the end of the American monopoly, the cleavage between the nuclear "haves" and "have nots" has become a source of serious friction. Britain has become a nuclear "have", but there is a growing demand in other allied countries—and not in France only—for the development of independent strategic nuclear deterrent forces. As a result, an expensive duplication of effort may be unavoidable.

Another potentially disruptive factor deserves attention because it too has serious military implications. It could be called the factor of

diverse historical heritage. Whereas the security of the United States is directly menaced only by the Sino-Soviet bloc, many of America's allies and friends are absorbed by threats to their national security that are related to the cold war only indirectly if at all. Obvious examples are the feuds between Israel and its Arab neighbors, between Pakistan and India, or between France and the Algerian rebels. Such conflicts or open hostilities between members of the free world affect the American military position in two ways. Valuable military forces that could be placed behind the collective defense effort against the Soviets are diverted to these conflicts and may even combat and destroy one another, and, secondly, the United States may be reluctant to throw its support to the side enjoying its main sympathy lest it antagonize the other side which is needed for its contribution to collective defense or lest it drive that side over into the Soviet camp.

Finally, the American defense task is complicated by the existence of a score of new and unconsolidated states outside of the Soviet orbit, most of them the products of emancipation from European colonial rule and some of them committed to policies of neutralism. In some instances, American military assistance may not contribute importantly to collective defense against the Sino-Soviet threat, and yet prove necessary as a means of stabilizing the country or of countering offers of Soviet aid. In other cases, such as those of Lebanon or Jordan, American military assistance may be required to forestall "indirect aggression" in the form of subversion or external fomentation of anti-Western revolution.

For all of these reasons, the tasks falling to U.S. military power are greater than if the coalition of free nations were able to concentrate solely on the danger of external Communist military attack. Force deployment, the requirements of military hardware, and the logistical problem are all affected by the problems that arise from the unsettled and, in many places, revolutionary conditions of extensive parts of the free world. No strategy of the United States and its allies can be adequate for a policy of containment that ignores the East-West competition for the allegiance of uncommitted countries, or neglects to adjust its military policy to the particular needs of this competition.

Part C. Technological Developments and the Strategic Equation

Chapter 1. Introduction: East-West Power Relations

A. THE "STRATEGIC EQUATION"

In a discussion of the impact of developments in military technology on the distribution of strategic military power, there are several points that should be clarified at the outset.

This section will concentrate on the "strategic level" of military power, the level at which force is supplied or threatened through the possession or employment of "strategic weapons." "Strategic weapons" are those weapons that may be used either to destroy the basic resources of a nation (its people, industrial capacity, communications systems, et cetera) or to attack the adversary's own "strategic forces."[1] Under present conditions, these weapons are air and missile forces armed with nuclear warheads within range of the enemy's homeland. Because of their range, destructive capabilities and short reaction times (the time required to bring them into action), strategic weapons dominate the power situation and set the stage for the determination of overall military strength and advantage. While the evolution of the distribution of strategic power will be explored in this section, the effects of nonstrategic employment of military force and the overall distribution of military power will be reserved for later consideration. Although we are aware that strategic power is not the whole of strategy, it *is* the precondition of strategy. Until the significance of recent changes in the strategic situation are understood, it is difficult to comprehend the far more complex problems of military strategy and national policy, although the solution to these problems clearly does not lie exclusively in "strategic" forces.

The "strategic equation," then, will refer strictly to the distribution of military power on the strategic level. As employed here, the term "equation" is not intended to imply an *equality* in military capabilities between two adversaries. Instead, it will be used to describe the power relationship between the strategic forces of adversary nations or blocs at a given time, whether or not this relationship favors one side or the other or is indeed in equilibrium.

B. THE BALANCE OF STRATEGIC POWER

It will be useful to distinguish between balance and imbalance in the distribution of strategic power and, in later chapters, in the distribution of nonstrategic power.

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[1] According to J. F. C. Fuller, at any given time, the weapon with the greatest "range of action" dominates warfare: "The dominant weapon is not necessarily the more powerful, the more accurate, the more blow-dealing, or the more portable; it is the weapon which, on account of its superior range, can be brought into action first, and under the protective cover of which all other weapons, according to their respective powers and limitations, can be brought into play. Further, the higher its striking power, accuracy of aim, volume of fire and its portability are, the more dominant will the weapon be." "Armament and History" (New York: Scribner's, 1945), pp. 7–8.

By common usage, and as it will be employed in this study, a "balance of power" means a condition of military equilibrium—albeit an approximate, shifting, and sometimes unstable equilibrium—in which neither side has, or believes it has, power sufficient to impose its will on its adversary by the threat or use of force.[2]

In the past, a balance of power usually implied a rough parity or equality in the prehostilities military capabilities of two adversaries which could generally be expected to produce a condition of mutual deterrence or a military standoff between them. Under present conditions, such a rough parity in the prehostilities forces of two countries which both possess considerable strategic nuclear forces holds no clear promise of a nuclear stalemate between them. Instead, mutual deterrence—or the stability of the power balance—will depend upon the invulnerability of the strategic retaliatory forces of the potential victim of an all-out attack, as well as upon the quality and numbers of the attacker's strategic forces, as will be shown later in this study. When neither side can expect that its offensive strategic forces would be able to destroy the other's ability to strike back with a retaliatory blow of intolerable proportions, a balance of strategic power and a condition of nuclear stalemate exists.[3] For the establishment of such a stalemate, a parity in prehostilities strategic forces is neither necessary nor relevant, and predictions of mutual deterrence based on a numerical comparison of these forces are deceptive and misleading.

No particular distribution of offensive first-strike capabilities can be equated, then, with an assured stability in the strategic equation. Even an overwhelming superiority of strategic power on one side—a substantial imbalance of power—would minimize the chances of nuclear war only if that side would refrain under all circumstances from taking advantage of its ability to start such a war.

Mutual deterrence or nuclear stalemate therefore presupposes a number of conditions concerning first-strike incentives and capabilities, on the one hand, and retaliatory capabilities and intentions on the other, which will be discussed fully in later chapters. Nevertheless, it can be said that Winston Churchill's "balance of terror" has come into existence since the two major opponents both possess very powerful strategic nuclear forces. A balance of terror has now been established in the sense that a resort to a first-strike city-busting or terror attack, directed deliberately at population centers, no longer represents a rational military strategy for either side. Since such a strike would leave the strategic forces of the opposing side intact, it would constitute an act of self-destruction, if not of suicide. While cities at a reasonable distance from strategic targets may therefore be regarded as relatively safe from intentional destruction at the outset of a Soviet-American nuclear war, provided the attacker acts rationally, the balance of terror gives no similar assurance that population centers will escape destruction in the course of second or third strikes—once strategic targets have been saturated or once forces capable of taking them out are no longer available.

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[2] For a classification of the many different uses of the term, see Ernst B. Haas, "The Balance of Power: Prescription, Concept, or Propaganda?", "World Politics," vol. V, No. 4 (July 1953), pp. 442–477.

[3] As Thomas C. Schelling put it: "It is not the 'balance'—the sheer equality or symmetry in the situation—that constitutes 'mutual deterrence'; it is the *stability* of the balance." See his "Surprise Attack and Disarmament," in Klaus Knorr, ed., "NATO and American Security" (Princeton, N.J., Princeton University Press, 1959), p. 178.

In the current world situation, which is characterized by an extreme bipolarization of power, the state of the military power equation is so predominantly determined by the relative power positions of the United States and the Soviet Union that this discussion will concentrate on the distribution of power between them. This is not to suggest that their respective positions are not substantially affected by the additional strength they may gain from association with third countries, either in the form of military alliances or of less formal alignments. Nevertheless, the most spectacular change in the state system since World War II has been the decline in the ability of lesser powers, either singly or in combination, to upset a power equilibrium or to eliminate, possibly to reverse, a state of disequilibrium between the two superpowers. Thus, the cold war and the arms race may be regarded as a "balancing process" in which the two major adversaries are trying either to deter each other or to maintain, gain, or regain a predominance of power.

Since World War II, a condition of imbalance has predominated in the distribution of strategic power—that is, in the United States-Soviet strategic equation. While the United States enjoyed undoubted superiority and the benefits of an imbalance in its favor during the initial phrases of the cold war, its position was later challenged by the Soviet Union whose technological achievements by 1957 threatened the possibility of a future reversal of the imbalance. Although consideration will be given later to the importance of an overall balance of military power, transcending the balance on the strategic level alone, Part C will survey changes in the strategic power equation toward balance or imbalance and toward stability or instability. And while this study will concentrate on the technological forces responsible for those changes as well as the technological foundations of military power, the nontechnological elements of power will be briefly summarized in this chapter.

C. THE NONTECHNOLOGICAL ELEMENTS OF POWER

Technological forces alone have not set the stage upon which the strategic contest is being played. An adequate appraisal of changes and future trends in the strategic equation must transcend the technological factors that influence strategic power and must also examine those nontechnological factors, traditionally considered elements of national power, that affect the ability and propensity of the major adversaries to develop strategic power. Although some of these nontechnological factors do not directly bear upon the strategic equation, they do affect the distribution of military power and therefore establish the scope of and conditions surrounding the strategic contest. In this sense, their brief identification in this introductory chapter will be relevant to our later discussion of the strategic picture.

Nontechnological factors may appear as national assets or liabilities in the power equation. Factors that figure simultaneously as elements of power in both camps can be considered common assets, while factors can be termed "unique" if they clearly benefit one side alone, either because the other side does not possess them at all or because it is inhibited by circumstances from exploiting them effectively. If an element of power is available to one side in greater quality or quan-

tity, it may be said to create an "asymmetry" in the distribution of power to the advantage of that side. Such asymmetries may cancel one another out, so that together they will not affect the power equation. Nevertheless, the effects upon the power equation of some asymmetries, like those that result from unique assets stemming from a nation's peculiar political system—the Soviet advantage in military intelligence, for example—may be very difficult or costly to counter. In such cases, an imbalance may only be avoided if the disfavored side either emulates its opponent's system or if it manages to muster compensating advantages in other elements of power. By the same token, from the viewpoints of cost and effort, it is preferable to exploit a unique advantage rather than to compete on the basis of common advantages.

Geographical factors.—Traditional surveys of the elements of national power assign to geography a position of major importance, but recent technological developments have reduced the significance of some geographical factors as balancing or imbalancing elements in the power equation. Sheer physical size, however, remains a factor of military power, though an asset common to both major adversaries in the cold war. The United States and the U.S.S.R. are both amply supplied with space to maneuver and to disperse military installations, industry, and population. As for location, formerly the United States' most striking advantage, it has become a diminishing or even vanishing American asset under the impact of weapons developments. No change brought about by long-range nuclear power has had more drastic effects on the American position than the compression of time and space it has occasioned. Gone is the degree of military security that the United States enjoyed by virtue of its remoteness from the centers of actual or potential hostile power. At the same time, while the compression of time and space multiplied the interests and responsibilities of the United States abroad, its remoteness from its friends and allies on the Soviet periphery has remained an obstacle to the speedy and adequate fulfillment of those defense commitments that require nonstrategic forces.

However, these changes do not mean that the United States has lost all of its positional advantages to the Soviet Union. Its control of the seas remains undisputed at the present time. It still retains and can utilize the encircling position of its allies around the edges of the Soviet "heartland" of Eurasia, as well as its dominance of the oceans and waterways of the world. While ICBM's remain more costly and less accurate than shorter range means of attack, distance may still not be a negligible military factor. It may continue to be a U.S. advantage that the United States has European allies from whose territory the Soviet Union can be attacked, while the latter can return the attack upon the United States only at long range.[4] Moreover, the unique ability of the United States to operate at close quarters to much of the Soviet periphery facilitates the radio penetration of the Soviet bloc and the collection of communication, elec-

[4] Some writers on this subject, treating both cost and accuracy of missiles as functions of range (the costs going up and the accuracy down as range increases) place great emphasis upon the advantage the United States enjoys by being able to emplace IRBM's in Europe. On this, we incline to skepticism, not only because the Soviet lead in IRBM's is even greater than their lead in ICBM's, but also because few of the missile technicians seem to feel it will be impossible to give ICBM's all the accuracy they need against their assigned targets.

tronic, and other forms of intelligence. Finally, the location of our bases on the Eurasian rimland can prove of major importance to our military capabilities in the event of future limited wars.

Natural resources.—An abundance in natural resources is another traditional element of military power, in which the United States and the Soviet Union are equally favored. Both are generously supplied with basic raw materials, either within their own borders or easily accessible to them. Here, there is symmetry.

Population.—It has been usual to assume that the demographic factor favors the Soviet Union. The population of the Soviet Union is approximately 208 million as against 180 million for the United States. The aggregate population of the NATO powers, in Europe and North America, however, is around 450 million, while that of the Soviet Union and its European satellites is but 300 million, and the loyalty of many, such as the Hungarians and Poles, must be doubted. In the European theater, the demographic factor therefore would seem to be asymmetrical in favor of the West and not the other way around.

It is only if the vast population of Red China is added to that of the Soviet Union that the demographic factor swings in the opposite direction. But it must be remembered that Red China's contribution is not of direct significance to the European military balance. Though the Chinese masses might largely influence the outcome of an all-out Asian conflict, it is hard to imagine a conflict in Europe of such duration and such requirements that the Soviet Union would resort to the importation of Chinese troops. Moreover, numerical superiority in the absence of other factors that are necessary to the transformation of sheer manpower into military strength is, in itself, no guarantee of military advantage. The history of Imperial China, with a population vastly superior to that of its neighbors, is the classic example of the insufficiency of the demographic asset alone.

Military manpower.—More important, then, are the social, political, and economic skills necessary to the mobilization both of effective military manpower and of the labor force required to produce the material requisites of war. In the first, the mustering of military manpower, the Soviet bloc is clearly superior, and in the second, the skilled labor force, it is overcoming its earlier inferiority.

Since World War II, one of the most striking features of the military equation has been the large military establishment maintained by the Soviet Union—and by Red China. Some Soviet forces are obviously needed for purposes of internal security and for control over the satellites, but the great size of these forces also reflects certain Soviet convictions based on experience, ideology and political tradition. In the tradition of past continental countries, the Soviet Union has maintained large ground armies in peacetime, a policy justified in Soviet eyes by the existence of actual or presumed "enemies of the Revolution." Moreover, at least before predictions of the short nuclear war had impressed them, the Soviets were convinced that, in a major war, their system would stand or fall by its peacetime maintenance of forces-in-being as the only possible counter to the dreaded "arsenal of democracy"—the almost limitless capacity of the United States to build military strength under the spur of wartime necessity. This faith in massive ground forces had been encouraged by the fundamental conservatism of Soviet military thinking which, though not

unaware of the advantages of sputniks and missiles, counsels preparation for all contingencies. And in Soviet experience the recurrent threat has been a ground invasion from the West.

The nature of the political system, of course, accounts for the ease with which both the Soviet Union and China are able to maintain armed forces at a level far above that of their Western opponents. With little public pressure against a high degree of mobilization, and with the traditions of discipline, collective action and service for the regime, the Communist states can produce armies that constitute a serious asymmetry in the balance of power on the level of nonstrategic forces. To the extent that American strategic and tactical nuclear power are matched by Soviet capabilities (a possibility that will be discussed in following chapters), this Soviet asset may become a factor of great significance.

Industrial capacity.—Industrial capacity, together with scientific and technical skills, are the elements of power most clearly related to the promotion and exploitation of advances in military technology. It is in this area that the Soviet progress has been most remarkable, both in the speed with which it has moved and in the extent of its accomplishments.

Even in the absence of an ideological incentive to match the skills of the capitalist nations, it could be expected that nations with the potentialities of Russia (and China)—once launched on the road to industrial development—would strive to narrow the gap painfully separating them from the advanced Western nations. And the industrialization of Russia had been underway long before the revolution of 1917. Nevertheless, the gap is now closing at a rapid pace in some fields and at the expense of a former major U.S. asset—its unquestioned superiority in these industrial, technical and managerial fields.

One disturbing factor contributing to the diminution of this American asset has been the significantly higher Soviet growth rate in certain heavy industries, notably the metallurgical industry. Although recent comparisons of overall Soviet and American industrial growth rates,[5] based on Soviet estimates and the official value of the ruble, may prove misleading, it is incontestable that the Soviets have placed great emphasis on—and achieved substantial results from—the development of capital goods rather than consumer goods industries. This may become a factor of grave significance for the future military power equation if present trends continue. Despite an estimated Soviet gross national product less than half of the American GNP, it has been said that annual Soviet investments in industry, as well as Soviet military outlays, are now comparable to our own.[6] With a broadening economic base, the ability of the Soviets to devote twice the proportion of their GNP to military purposes than does the

[5] See, for example, the estimates of the Director of the Central Intelligence Agency, Allen W. Dulles, who credited the U.S.S.R. with an industrial growth rate of 9½ percent for the 7-year period through 1958, as compared with a U.S. rate of 3.6 percent for roughly the same period. (The text of his address before the Edison Electric Institute, New Orleans, is published in the New York Times, Apr. 9, 1959, p. 8.

[6] See also Allen W. Dulles, "Some Implications of the Soviet Threat," Department of State Bulletin, vol. XLI, No. 1052, Aug. 24, 1959, pp. 274–278. Some economists question the prevailing view that the Soviet economy is growing faster than the U.S. economy, asserting that the larger estimates of Soviet growth are based on statistical distortions by Russian authorities. See "Soviet Disputed on Growth Rate," New York Times, Sept. 29, 1959, p. 24.

United States may have important implications for the future power equation.

The continuing value of the greater size, flexibility, and mobilization potential of the American industrial system should not, however, be underestimated. The extensive and powerful economic base of the United States, coupled with that of Western Europe, makes possible the assumption of military and technological development programs of greater cost, variety, and intensity than could be borne by the Soviet Union, but only if available resources are used more efficiently.[7] Under such conditions, the United States may be in a position to compete effectively with the Soviet Union in a peacetime arms race.

The wartime military significance of the American asset in industrial potential has rapidly diminished, however, in recent years with the rise of strategic nuclear air power. No longer is there any assurance that this vast potential can be transformed into an arsenal for war after hostilities have begun. Then, if strategic air power is brought into action at the start of a war, the industrial contribution to the power equation must be measured in terms of its military product already in existence at the outset.

Technical skills and leadtime in research, development, and production.—U.S. productive capacities depend not only on its physical plant and financial and material resources, but also on the human resources of scientific and technical skills. If properly exploited, these skills could contribute substantially to improvements in quality, quantity and leadtime in the development of modern American weapons systems.

The Soviet Union no longer lags behind the United States in producing scientific and technological feats of profound military significance, as the early Sputniks dramatically demonstrated.[8] The situation is now one in which both adversaries may be expected to produce roughly comparable achievements in military technology in the areas to which they give highest priority. Under these conditions, the administration of technological projects, research and development (R. & D.) and production methods, decisions on the validity and priorities of different programs, and the time required to translate a weapons concept into an operational weapons system (leadtime) are all factors of crucial importance for the future military position of the United States vis-a-vis the Soviet Union.

The importance of leadtime in military R. & D. production cannot be overemphasized in an age when military power depends to a large extent on countering, matching, or exceeding the technological achievements of the adversary.[9] If the Soviets establish a pattern of rapidly introducing and producing major weapons systems in advance of the West, the threat to American security would be increased and

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[7] See ORO–T–380, The Army Production Base (Bethesda, Md.: the Johns Hopkins University, draft August 1958).

[8] The extent of Soviet scientific and technological abilities was already apparent in early Soviet successes in the field of nuclear weapons development, with a high level of nuclear research achieved by Soviet scientists prior to World War II. A Rand Corp. study on this subject comments that prewar Soviet research of nuclear physics "could not have, in any sense, been judged inferior to that of the West." M. J. Ruggles and A. Kramish, "The Soviet Union and the Atom: The Early Years," RM 1711, Apr. 2, 1956. p. 86.

[9] "As war becomes increasingly complex, technology becomes more and more important. In fact, if the strategy of the Soviets or the West were to be decisively successful without tactical battle it would be in the field of technology, for technology contains all of the elements short of war itself." Lt. Gen. James M. Gavin, "War and Peace in the Space Age" (New York, Harper & Bros., 1958), p. 236.

the advantages the Soviets already enjoy in choosing the form and place of conflict, in military intelligence and in civil defense preparedness, would tempt them further to seize the military and diplomatic initiative.

It has been charged in responsible quarters that the Soviets have already established a pattern dangerous to our security by producing new weapons in consistently shorter research, development, and production times than has the United States. The charge is not directed at the energy or originality of our scientists and engineers, but at unnecessary delays in the R. & D. process caused by cumbersome centralized bureaucratic machinery, a search for perfection, insufficient willingness to take and accept risks, and, in some cases, undue reverence for budgetary controls.[10]

Certainly, a continuing lag behind the Soviets in the factor of leadtime could endanger the U.S. security under conditions in which American military strength is becoming increasingly dependent on new weapons technology. With the current average of 5 to 10 years required to cycle a weapons system from concept into deployed hardware, the U.S. strategic position of the future will be largely determined by decisions and efforts made now.[11]

The extent of the present American lag behind the Soviets in leadtime may be exaggerated, since the information on which estimates are based is often deceptive. It is true that the Soviets appear to have produced their Bison bomber in a far shorter period than that required for the American counterpart, the B–52. Also the various models of their MIG fighter series seem to have become operational more rapidly than successive American fighter models of comparable performance. And, of course, there are the A- and H-bombs and the various long-range missiles, all of which they produced in a far shorter time than American experts estimated they would need.

However, it is not always known when the Soviets began R. & D. on a particular item. The Kremlin does not issue bulletins, as does our Defense Department (and prime contractors) when a project is initiated, but only unveils the finished product when it is appropriate to do so; for example, on a national holiday as when the Bison was unveiled on May Day 1957.

Moreover, a shorter leadtime is not necessarily an asset in the military power equation if it is achieved through sacrifices in quality, expense, or in the future possibilities of quantitative production, if any of these factors outweighs the importance of a shorter development cycle for the particular weapon. The Soviets appear to rush some of their weapons systems into operation without the refinements our services introduce during the development cycle. The 16 to 1

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[10] An informed commentary concludes that "one of the major weaknesses in our strategic posture has been our inordinately long leadtimes." "International Security: The Military Aspect," Special Studies Rept. II of the Rockefeller Brothers Fund (New York 1958), p. 34.

Dr. Wernher von Braun, contending that the United States lags some 1 to 3 years behind Soviet space programs, states: "We have the brains, the resources, and the capability, but we are hampered by continuous evaluations, justifications, rejustifications, instead of progressing in our development in space projects." From "Von Braun Vexed by U.S. Space Lag," New York Times, Sept. 16, 1959, p. 14.

[11] Whereas the time lag between discovery of a new design principle and the "fielding of power in being" often takes the United States about 10 years for a new weapons system, Russia frequently accomplishes it in 7. James B. Edson (then Assistant to the Director of Research and Development, Department of the Army), "Weapons Systems in Relation to Foreign Policy," in National Security in the Nuclear Age (University of Minnesota, Minneapolis, 1958), pp. 8–9.

U.S. advantage in planes shot down when American jet fighters tangled with the Soviet MIG's over Korea cannot be attributed solely to the superior tactics and training of our pilots. The more recent success of the Chinese Nationalist Air Force, armed with American planes and the Sidewinder infrared-guided missiles, also tends to confirm the soundness of our air weapon approach.

Whether quality or a shorter leadtime is more important must be judged in the light of the purpose the particular weapons system serves. In some instances, possession of a weapons system long in advance of one's opponent may create a major asymmetry in the strategic equation (as in the case of Soviet ICBM's), while the perfection of the system may be relatively less important.

There is also some evidence that the Soviets have compressed weapons leadtimes by sacrificing the most efficient use of material and human resources and, in a few instances, at the expense of achieving quantity production capabilities. Again, these sacrifices may prove worth while if a shorter leadtime produces a military advantage.

Whereas it has been the American practice to pursue product design and production planning sequentially—with perhaps 3 years in perfecting the weapon in R. & D., and another 2 or 3 years in designing and building the tools necessary to produce the weapon—the Soviets are credited with carrying out design and production planning simultaneously. Although in this manner they may cut several years off the development cycle, their total investments—financial and human—may be more costly than American investments.

In comparison with the American record, Soviet leadtimes appear to be shortest in many of the more sophisticated weapons systems, unfortunately the systems which, if perfected first, threaten to create the most dangerous asymmetries in the distribution of strategic power. A recent study [12] has argued that the American leadtime lag in this field is due to production factors characterizing the American system. According to this study, U.S. product design is governed by considerations of efficient production, determined by the competitive nature of U.S. society. If a U.S. company has a military design contract, the design engineers will take into account the fact that the product will be built in an existing production plant, preferably that of the company having the design contract. They will tend to design the product so that it can be built at the lowest possible cost consistent with a given set of requirements. The product will, therefore, often be built, to the extent possible, on equipment already in place and in operation, in order to avoid the capital charges that would be incurred in building a new plant or buying new production equipment.

Soviet design engineers do not operate under this constraint, the study points out. Their probable overriding concern is to build a product that will function efficiently, regardless of cost considerations. In extreme cases, especially with respect to the most critical weapons, they are presumably prepared to build the product in the laboratory, if necessary. The Soviets do not need to make their designs conform to existing industrial production equipment. Thus, while U.S. prototypes, designed to be built as efficiently as possible, may ultimately be produced in much greater quantity than Soviet products, this constraint on American design engineers may also ac-

[12] ORO–T–380, "The Army Production Base" (draft August 1958), cited above.

count for the number of failures and the extended periods of development that have allowed the Soviets "to get there first."

If this is the case, the study concludes, there would appear to be grounds for coordinating design R. & D. and production R. & D. to insure that design engineers are fully apprised of the most advanced production technology and that they are provided with the most advanced and efficient—rather than existing and frequently outdated—machine tools on which to base their designs. In this manner, many of the production "bugs" that extend leadtime may be avoided.

That the Soviets are outdistancing the United States in many weapons leadtimes does not necessarily suggest an *inherent* shortcoming in the American political and economic system. In the past, the United States has demonstrated its ability to compress R. & D. times on projects of recognized urgency, even in peacetime, but particularly under the pressures of war. Our record in World War II illustrates our potentialities in this field; then we were more willing to decentralize authority, less scrupulous in generating wide agreement, less cautious on the score of ultimate reliability, and more prodigal of resources.[13]

Although obstacles inherent in our culture and institutions may be important factors, our longer leadtimes may be attributed also to current judgments on the degree of effort required, both in terms of estimates of the national emergency and in terms of the relative urgency of different programs. Recent projects given high priority, like the Jupiter IRBM, have proved American abilities to develop a radically new system in a remarkably short period—3 years—while, in a low priority field, like small arms development for the Army, the new M–14 rifle can spend 11 years in the R. & D. cycle and another 7 years in fully replacing the present M–1.

Even the much criticized IGY satellite program, Project Vanguard, illustrates that one of our major leadtime problems may be in judgments of R. & D. priority rather than in the ability of our scientists and engineers. The Vanguard program was a technological success of considerable merit; it produced an operational missile in half the time required for the development of the average missile, and it placed a satellite in orbit on its sixth test shot. Vanguard's failure to beat the first sputnik into space stemmed from decisions at the highest governmental levels on the project's importance, with the result that Vanguard was divorced from the mainstream of missile development and assigned initially a relatively low level of priority and funding.[14]

Our leadtime lag nevertheless remains a serious problem, if, as has been suggested, it will allow the Soviets to capitalize first on scientific breakthroughs and even produce counterweapons to our newest de-

[13] The most spectacularly successful governmental research organizations during World War II were the Manhattan District Project and OSRD, examples of the value of competition in R & D and of decentralization. See Charles Hitch, "The Character of Research and Development in a Competitive Economy," Rand Corp. report, P–1297, May 13, 1958.

[14] For a concise history of the Vanguard project, see "Project Vanguard, A Scientific Earth Satellite Program for the International Geophysical Year," a report to the Committee on Appropriations, U.S. House of Representatives, by the Surveys and Investigations Staff, Dec. 22, 1958; reprinted in "Department of Defense Appropriations for 1960," hearings before the subcommittee of the Committee on Appropriations, House of Representatives, 86th Cong., 1st sess. (hereinafter referred to as House Hearings on Fiscal Year 1960 Defense Budget), pt. VI, pp. 54–72, Apr. 14, 1959.

vices that may nullify their effects.[15] The Soviet system as a totalitarian dictatorship must be granted the ability to make R. & D. decisions with greater ease and to execute them with greater speed, while mobilizing support for its chosen programs with less difficulty than its democratic opponent. Such a decision-making capacity, however, is not an unmixed advantage to the Soviet Union. The difficulty and danger of criticizing official decisions in a dictatorship may lead to less refined and more costly end products, as well as to the production of weapons ill-suited to the support of national strategy.[16]

These qualifications of the American leadtime problem are not intended to suggest that some radical revisions of our R. & D. thinking and procedures will not be necessary. Boldness in the acceptance of new ideas and speed in their execution are qualities too often lost. Too frequently, rigidities that ought to be characteristic of the Soviet system are allowed to infect the decentralism that should characterize the American system. The complexity, flexibility, and surplus capacity of our industrial system, as well as the broad and expanding scope of private and Government research, still constitute advantages the Soviets cannot hope to match, if we properly exploit them. Yet, the current popular cries to improve R. & D. through "czars" and through elimination of "wasteful duplication" and "service rivalries," when put into practice, frequently lead to excessive administrative supervision, the blocking of new and useful ideas, and the fallacy of directing long-range R. & D. programs toward an impractically specific end product.[17]

Recent studies have suggested, instead, that it would be valuable to lessen bureaucratic centralism and to increase duplication of effort at all stages of military research and development, particularly in the earlier stages where duplication is cheap. Not only would the exploration of multiple paths tend to produce more results of greater military significance, but the incentives of increased competition might also shorten leadtimes.[18] The importance of encouraging the services both to "duplicate" and to take risks in scientific areas of military significance is well illustrated by the course of Project Tepee, the recently announced Navy system for detection of missiles and nuclear explosions at global range. Tepee duplicated in some functions the multimillion dollar Air Force radar missile warning net. It was given only a marginal chance of success and low initial funding, but despite these handicaps (and the apparent necessity for Tepee scientists to spy on their sister services to obtain overclassified missile launch data),[19] the system was developed with considerable speed and promises to be of great value.

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[15] See the testimony of Lt. Gen. Arthur G. Trudeau, Army Chief of R. & D., in House Hearings on Fiscal Year 1960 Defense Budget, pt. VI, p. 338, Apr. 21, 1959.

[16] The Soviet Union's extensive postwar construction of both cruisers and short-range submarines is illustrative here, as both systems appear to be of limited utility in modern warfare. A better known example of a dictatorship's problems in this regard is that of Hitler's mistaken, but unchallengeable, decision to divert German jet aircraft production from interceptors to bombers in the closing phase of World War II.

[17] See Burton Klein, "A Radical Proposal for R. and D.," Fortune, vol. LVII, No. 5 (May 1958), p. 112 ff, in which he argues that the unpredictable nature of technological progress calls for "more emphasis on exploring many avenues of technology without insisting that a precise goal wait at the end of each avenue."

[18] Hitch, op. cit., pp. 11–12.

[19] John A. Osmundsen, "Navy Missile Monitor Detects Firing Anywhere in the World," New York Times, Aug. 8, 1959, p. 1.

The leadtime lag behind the Soviets is not an insurmountable problem. The contrast between American routine performance in peacetime and the burst of production creativity put forth in wartime is highly instructive. With superior physical and human resources, the United States has not yet fully responded to the Soviet challenge in this field, while the current missile gap attests to the gravity of the U.S. failure to meet this challenge.

Three other less tangible factors—strategic thought, military intelligence, and "the initiative"—deserve attention in view of their special relevance to the military equation under conditions of nuclear and long-range strategic capabilities.

Strategic thought.—In the field of strategic thought there is nothing to indicate a past or prospective Soviet advantage. The essential conservatism of the Soviet approach has already been noted. Their postwar preoccupation with massive ground forces and their reluctance to exploit the possibilities of strategic airpower are well known examples of their inclination to prepare for the kind of war with which they are familiar. Though the early commitment of the Soviet Union to long-range missile development is the striking exception, Soviet military thinking has generally followed Western thinking, with a timelag of 2 to 3 (and as much as 10) years.

In one respect, Soviet military conservatism may rebound to their advantage—their insistence in preparing for a long war, fought basically on the ground, despite Western predictions that the next great war, if it comes, will be a brief, all-out nuclear exchange. If a stable nuclear stalemate should come to dominate the strategic equation in future years, Soviet ground force capabilities may prove a tremendous asset.

Military intelligence.—During the next few years, while U.S. strategic retaliatory forces remain highly vulnerable to surprise attack, the apparent Soviet advantage in the field of military intelligence—especially target intelligence—will have special significance for the strategic equation. This Soviet asset may be credited to the peculiar nature of the Soviet political system which contrasts so sharply with our own. Whereas, in our "open" society, a large amount of important military information is available by observation or from newspapers or technical journals, in the "closed" Soviet society these facts can be obtained only by organized espionage, by defectors, or by our intelligence bases on the periphery of the Soviet Union. Even our military secrets are less secure than those of the Soviet police state, but the importance of espionage as a factor in Soviet technological achievements has probably been exaggerated in the public debate. Moreover, the ability of U.S. intelligence organizations on occasion to penetrate the Soviet veil of secrecy, despite the obstacles in their path, has been demonstrated.

Possession of the initiative.—Perhaps the most difficult factor to evaluate is the factor of "the initiative." It is clear that the initiative has been on the side of the Communist camp in all of the serious crises in which the two blocs have faced each other—and also in Korea and Quemoy where overt military force was used. And it is also clear that where there is resort to military force the possession of the initiative represents a major strategic advantage, particularly as long as an extremely high premium is placed on a first-strike strategic

attack. Whether the Soviet Union would risk the initiation of a war in which it expected U.S. strategic-nuclear forces to become involved cannot be predicted, but it should not be overlooked that the Soviet possession of the initiative is in part derived from Bolshevik doctrine on the role of warfare as an instrument of national policy. While we are heirs of a tradition that only defensive wars are just (though we reserve the right to decide what military actions we shall consider "defensive"), it is the Russian view that wars that serve the purposes of communism—hence the purposes of the Soviet Union—are just, with no distinction between "aggressive" or "defensive" except for propaganda purposes. Although this does not mean that war is preferred to other less destructive and risky instruments of policy, such a view yields to our adversaries the privilege of the military initiative which, under present conditions, means conceding them the advantage of striking the first blow. It may also mean that they can take greater risks of war in pursuing a particular goal than can the United States. This capacity for risks is reinforced by ability of the Soviet authoritarian regime to back down from an exposed and overcommitted position far more easily than can a popularly based regime.

Nevertheless, we should qualify the extent of this initiative by recognizing that, despite the imperialist and revolutionary character of Soviet policy, the Soviet leaders are also cautious, pragmatic, and probably less disposed to military conquest than to conquest by other means. Although Soviet doctrine predicts ultimate conflict between the forces of "imperialism" and the Socialist world revolution, the conflict is supposed to result from a decision of the "imperialist" powers to extirpate communism, not from a Communist resolve to complete the revolution in one move. The Soviets view conflict as an extended, protracted, grinding process in which the weapons are varied, with the preference given to those that offer greatest probability of success at minimum risk.[20] Despite their attitude toward war as a legitimate instrument of policy in a "good" cause, war has become an increasingly risky affair, and they will probably be reluctant to jeopardize the certainty of current achievement for the chance of future violent expansion. Even so, the possibility of a Soviet surprise attack is one that American policy-makers cannot afford to discount.

American foreign policy has been criticized on the grounds that it should seize the initiative, but few critics are willing to declare themselves in favor of dynamic American policies that would include the initiation of war. Such policies would run counter to current deep-seated American convictions regarding the use of force and the evils of aggression. It has also been suggested that the United States reduce the extent of the Soviet initiative advantage by the adoption of policies that would seize the initiative in nonmilitary fields—the "psycho-political initiative," as it is called. Their effects upon the strategic equation will probably be limited, however, in comparison to the impact of the military initiative. These limits were demonstrated in a striking fashion in 1956 when our moral support and encouragement to the Hungarian revolutionaries proved no substitute for military assistance. However, the United States has shown a

[20] A strategic concept recently detailed by Robert Strausz-Hupé, William R. Kintner, James E. Dougherty, and Alvin J. Cottrell, in "Protracted Conflict," Harper & Bros., New York, 1959.

greater willingness than most status quo nations of the past—especially democracies—to take risks in defense of broad free world interests, as its "brinkmanship" in the case of Quemoy and its intervention in Lebanon have proved. Though it lacks the revolutionary and imperialist dynamism (the cause of so many wars) that the Kremlin has so ably blended, the United States has not hesitated to extend its defense perimeter to include many exposed and weak countries in remote areas of the world. Its acceptance of these responsibilities, as well as its moral commitments to promote the cause of captive and partitioned countries by measures short of war, do not indicate the lack of initiative characteristic of the traditional attitudes of status quo countries.

Psychological factors.—There are other elements of power that should be discussed if the degree of their impact on the distribution of power could be properly evaluated. A nation's morale, for example, could be a factor of immense importance for its military strength. Its spirit of collective action and its willingness to suffer hardships might spell the difference between victory and surrender. It may be hoped that the Soviets will not, like the Nazis, underestimate the ability of the "soft" democracies to rally these forces in a crisis.

Like morale in war, a nation's determination or resolution in peace may affect the outcome of a battle of mutual threats, and it is especially important for a strategy that relies heavily on deterrence. Though convincing determination to carry out one's threat if challenged is a prerequisite of successful deterrence and thus an element of power, it alone cannot guarantee the credibility of a threat of self-destructive action. Whether the United States can match the Soviet Union in apparent determination must remain to be evaluated in the light of specific circumstances. It would be safe to assume, however, that the credibility of each side's resolution will be largely a function of their relative military capabilities.

Conclusion.—After this review of the nontechnological elements of national power it would be useful to present a balance sheet indicating the degree of their impact on the Soviet-American equation. While rough comparisons have been made between United States and Soviet strengths in each individual asset, unfortunately these assets are too disparate and too imprecise for an accurate appraisal of their combined effect upon the distribution of power. But it can be concluded that, although the United States retains substantial advantages in some of these nontechnological fields, existing or developing asymmetries in favor of the Soviet Union may have dangerous implications for the future security of the United States and its allies unless efforts are made to counter their effects. In the light of this review, we may now turn to consider the impact of the technological developments on the distribution of military power between the United States and the Soviet Union.

Chapter 2. The Assessment of Technological Change

The apparent impact of technological change upon national military power, and thereby upon the international scene, is often deceptive. What seems obvious at first sight turns out upon closer examination to be a surface manifestation, and more obscure factors frequently qualify and may even reverse the initial appraisal. One of

these factors is the matter of timing—the lag between the initiation of the change and its eventual realization in a perfected military weapons system. Another is the difficulty of adapting the change to other elements in the combination of weapons systems on which national military strength depends. Usually, there is further delay before the national military strategy itself is adjusted to the change. Finally, accompanying the phasing of new developments and the accommodation of national strategy is the psychological factor—the impact of the change upon strategic thinking in both the country that first achieves the technical advance and abroad. Between national adversaries of roughly comparable technological capabilities, so that a weapons development that occurs first in one country is almost certain to follow in the other, the combination of these factors often obscures or falsifies the significance of the change for the strategic equation.

A single example will serve to illustrate these difficulties of assessment. The United States first exploded a nuclear fission weapon in 1945; the Soviet Union followed in 1949. By 1954 both powers had developed fusion weapons. It must be assumed that in each country the stockpiles of both types of weapons began to accumulate soon after the first successful tests. What, then, was the United States "atomic monopoly" to which so many references have been made, and what was its significance?

Frequent assertions have been made about the political or military acts that the Soviet Union did not dare to commit because of the United States "monopoly" of nuclear weapons. Yet it was during the period from 1946 to 1953, from the Iranian crisis to the armistice terminating the Korean War, that the so-called cold war became the fixed character of United States-Soviet relations. During much of this period, international tensions were rising as the result of Communist pressures on the non-Communist world. Literally, the U.S. monopoly of nuclear weapons lasted only from July 1945, when the first A-bomb was tested at Alamogordo, N. Mex., until August 1949, when the first Russian A-bomb exploded in Siberia. But this was a period of intense Communist pressure on the West, when the Soviet Union was engaged in consolidating its hold upon the satellite areas of Central and Eastern Europe and was using every device short of war to extend its dominion into Western Europe.

It has been said that, without the U.S. atomic monopoly, the situation would have been much worse and that the English Channel might have become the western border of the Communist bloc. Such a claim seems to ignore, however, the very real weakness of the Soviet Union in the immediate postwar years, due to the massive physical and human losses of the war, just as it ignores the very real if largely demobilized nonnuclear strength of the United States, which had contributed decisively to the winning of two great wars in less than three decades and which had suffered no such attrition as had the Soviet Union. The postwar psychological depression of Western Europe, plus the early inclination of the American people to wash their hands of the consequences of the war, contributed to a depreciation of U.S. prestige and thus encouraged Stalin to exploit the Soviet Union's new confidence, born of victory despite the frightful losses of the war years.

In this confrontation of prestige and confidence, the role of nuclear weapons is difficult to distinguish. How do we weigh the value of the comparatively small number of low-yield A-bombs in the U.S. stockpile against Stalin's apparent conviction that nuclear weapons would not substantially change the nature of warfare (for example, in June 1948 when the blockade of West Berlin was initiated)? How great a contribution did the nuclear monopoly make to U.S. willingness to assume the risks of the Greek-Turkish aid program, the Marshall plan, and the North Atlantic Treaty? Was the U.S. Government any less bold, after the Russians in turn had mastered the atomic bomb, in meeting Communist aggression in Korea by immediate military intervention? And did this intervention reflect a conviction among those who made the decision that the United States enjoyed a decisive "lead" in nuclear weapons?

The introduction of nuclear weapons is the example, par excellence, of the impact of technological change upon the world military balance. Yet even this most sweeping of all advances in military technology did not lead to unambiguous changes in the relative military strength of the two powers which had emerged as global rivals from World War II. This is not, of course, to say that the impact of the introduction of nuclear weapons upon the world scene was unimportant. In fact, it accomplished a revolution in the nature of warfare and drastic revisions in the complexion of national military power. Married to the long-range aircraft which had resulted from the wartime acceleration of aviation development, nuclear weapons changed the emerging adversary relationship between the two superpowers from one that might closely have resembled the pre-World War I Anglo-German rivalry into a relationship that was quite unprecedented in world history. Moreover, the very character of the world distribution of military power was altered from a recognizable though tenuous "balance of power," in which the aggressive member of the society of advanced military nations could be successfully opposed by a countervailing association of states determined to preserve the existing situation, into a bipolar distribution, in which the two great victors of World War II far overshadowed all other nations.

It is because of this weapons revolution that the question of the balance or imbalance of military power between the United States and the Soviet Union has assumed an importance and an urgency it did not have before 1945, and probably could not otherwise have had after that date. However, when we examine this relationship, employing the U.S. nuclear lead as its most obvious index, it is significant that we find no very clear indications to tell us, historically, which of the two great nations profited most from the nuclear revolution, when if ever that profit has yielded a decisive advantage to one nation over the other, and how long such an advance may have endured.

We might, to be sure, devise a model of the two countries, identifying their critical targets and employing analytic methods to determine how many of these targets would have to be destroyed in either country to "defeat" that country by depriving it of the ability to carry on a war. We might then calculate what number of atomic bombs of the types available in the U.S. stockpile would have been required to

destroy a sufficient number of Russian targets to defeat the Soviet Union. Assuming that the growth of the U.S. nuclear stockpile were known to us, we should then be able to calculate objectively the precise moment in time at which U.S. nuclear power became capable of "defeating" the Soviet Union. Since the U.S. stockpile came into being at least 4 years earlier than that of the Soviet Union, we might reasonably assume that such an American capability came into being before a corresponding Soviet capacity to destroy the United States could have been reached.

Our calculus would be complicated, however, by the necessity of including other factors, notably the availability of the means to deliver the nuclear weapons on target. It may be that, at some moment during the period 1945–54, the United States did in fact achieve the winning combination of weapons and delivery means. But it is more likely that the United States, during its period of actual monopoly, never reached the level of capacity to make victory of this kind a certainty. Or, since American progress toward this level of capacity took place after the American monopoly had been broken, it is also possible that American capabilities were actually overtaken by Russian progress toward a level of capacity to "defeat" the United States—a possibility if the number of weapons required to deny victory to the United States were significantly fewer than the number required to defeat the Soviet Union. More likely, we should find that the requirement for attack capacity tended to grow as the capacity to retaliate came into being, so that there may never have been a moment at which the United States was in this sense decisively superior in its nuclear weapons and delivery means alone.

If there was a time when such a "victory" was a near certainty, it probably occurred several years after 1949, and the decisive factor was not so much the American lead in nuclear weapons as in long-range bombers. Moreover, this moment arrived, if at all, after the American development of fusion (hydrogen) bombs, but not because of them. And the period during which the United States very probably did possess a decisive military advantage over the Soviet Union was of comparatively short duration. More important, with these later developments as with the period of monopoly, the international scene was not immediately and accurately responsive to "objective" changes in the military balance.

The facts are difficult to come by. Even the most skilled and dispassionate observers differ honestly both as to the significance of changes in military technology and as to the precise time at which their impact is decisive. One should not expect that the soldiers who are to use the weapons produced by the change, and the statesmen who are responsible for wielding the national power created by the developments, much less the general public, will be objective in their comprehension and exploitation of the new developments. We may anticipate that in the future, as in the past, the technicians, the politicians, and the public will be uncertain, confused, and ambivalent in appraising these developments in national military power. Some people will regard the mere hint of a new development as a decisive increase in strength. Others will fail to recognize the change even after the new force is fully available. Some may simultaneously hold to the contradictory notions, as did many Americans during the period

of the U.S. nuclear monopoly, that the new development has changed everything and that it has changed nothing. Those who are responsible for the conduct of national affairs may find themselves saying that the latest phase of the race for leadership in military technology has yielded the United States (or the Soviet Union) an overwhelming and unassailable advantage, yet acting as though the balance of advantage were still undetermined—or even the reverse of their verbal claims. Moreover, the policymakers may sleep peacefully at night in confidence that the great strength of their country guarantees it against military attack or even diplomatic setback; yet by day they may struggle from crisis to crisis, painfully aware that national power to resolve international conflicts favorably is lacking.

It is not only that the "objective" significance of weapons developments is difficult to assess, even by the technical specialists, but also that the translation of these developments into usable weapons systems and the employment of the latter in turn to support foreign policy is a long road of many turnings. In this study, we may hope to achieve some degree of understanding of what constitutes "significance" in changing military technology, and we may thereby form some notion of the way in which a significant change may prove an advantage to one side and not to the other, or at least a greater advantage to one than to the other. We may reach some conclusions regarding the kind of significance that must be associated with a change if it is to yield one side or the other an advantage that is decisive. In all of these, we may expect to identify some element of objective reality, some hard core of physical change, but overlaid with and obscured by human problems of comprehension and communication that are mirrored in the time that is required to translate concepts into weapons, weapons into weapons systems and national strategy—and these latter into the tools of national policy.

Chapter 3. Generations of Military Technology

The military position of the United States has, in the short span of 15 years, declined from one of great security to one of great insecurity. This change is of course related to the rising military power of the Soviet Union, but the Soviet challenge could not have been made with such swiftness and success were it not for developments in military technology enabling that nation to threaten the security of the continental United States.

These developments were highlighted by the production of atomic and hydrogen bombs, long-range jet aircraft and ballistic missiles of intercontinental reach. Each of these achievements had an identifiable impact on the strategic balance and the strategy pursued by the United States, a subject to be examined in a later chapter. Their combined effect, however, was to deprive this country of an unquestionably secure military position based upon continental isolation and comparatively advanced technology.

To say this is not to ignore the factors of timing, appropriateness, quality and quantity that affect the political and military utility of weapons; the fact that the United States was the first to develop both nuclear weapons and vehicles suitable for their delivery has been of the greatest strategic importance. But it is the intention here to examine the strategic implications of recent technological develop-

ments for predictive purposes, and in this context realism demands that both adversaries be granted the capability of developing comparable weapons.

In assessing the strategic impact of the new weapons, progress in military technology over the past 15 years can be usefully regarded as a sequence of weapons systems "generations"—the conventional, the nuclear, and the nuclear-missile. These generations overlap to a far greater extent than their genetic equivalents—the human fist, for example, is still an effective "weapons system" [21]—but their characteristics are sufficiently distinct to permit separate identification.

A. THE CONVENTIONAL GENERATION

At the close of World War II the great powers were well into the last conventional (prenuclear) generation of strategic weapons, then known as the age of airpower. Had the cold war matured within this military environment, the United States, with its massive industrial base and the protection afforded by geographic isolation, might well have remained the dominant military power of the postwar world. The time and effort required for an enemy to mount and successfully execute a decisive strategic campaign against the United States would have provided this country with the requisite warning for mobilization of its industrial and military power.

The Soviets might, in time, have accumulated sufficient conventional long-range airpower to present a serious and direct challenge to the United States, much as Germany had challenged Britain's naval predominance prior to World War I. But our geographic vantage would have made it feasible to counter such a threat, perhaps at less expense than that required for the Soviets to mount it.

This could have been done by a coordinated buildup of ground forces with our European allies, coupled with an accelerated development of our then dominant seapower and airpower. Matching a military effort of this magnitude appeared beyond Russian capabilities in the immediate postwar period and it is quite possible that Soviet resources alone would have been inadequate to overcome our airpower lead. If the Soviets could gain control over Western Europe's industrial plant, however, they could have more easily hoped to build the navy and the intercontinental air force necessary to exert military pressure upon the United States.

Such an appraisal could have shaped a "conventional" strategy of bolstering the local defenses of our allies while supporting them with a guarantee that our strategic airpower would intervene to redress the Russo-European manpower imbalance should they be attacked. So great was our potential for such a war that it is reasonable to believe that the Soviets would have been deterred from attack.

B. THE NUCLEAR GENERATION

The addition of nuclear weapons to the United States and then to the Soviet arsenals ushered in the nuclear generation. Coupled with the development of long-range delivery vehicles in the form of jet

[21] A "weapons system" includes a weapon, or multiple of weapons, and all the equipment, material, personnel, and support elements needed to employ the weapon against the enemy. The term is usually restricted to complex and major systems such as aircraft and missiles.

aircraft, their almost immediate consequence was an abrupt alteration in the importance of time and space in warfare, combined with a radical reduction in the number of weapons and delivery vehicles needed to inflict great destruction upon an enemy. Since defense capabilities did not improve sufficiently to offset this quantum jump in destructive power, the net military effect was a triumph of the offensive.

No longer did this country require tens of thousands of bombers for the waging of strategic air warfare or the guaranteeing of effective assistance to threatened allies. But by the same token, the Soviets were no longer compelled to create a numerically massive air force in order to threaten the United States. Defense of Western Europe's growing industrial capacity was, in this sense, no longer tantamount to the defense of the United States.

The implications of this revolution in weaponry were obscured at the time by what was believed to be an American monopoly of nuclear explosives. From a monopolist's standpoint, nuclear weapons could be, and in fact were, regarded as an inexpensive means of accomplishing a variety of diverse military and political objectives through the threat of their use. This was the initial reaction to nuclear armament of strategists on both sides of the Atlantic.

Enthusiasm for the new power was temporarily chilled by events in Korea that demonstrated how Communist conventional strength could be effectively employed despite the nuclear threat, or even because of it. The suspicion grew that defense of both Western Europe and our other allies on the periphery of the Communist bloc called for larger ground and tactical air forces than were then available. But the Korean armistice of July 1953 removed the sense of urgency surrounding these problems and the continued buildup of U.S. strategic airpower made a return to the strategy of an atomic monopolist seem both feasible and attractive at a time when the actual monopoly, or more accurately a nuclear dominance, was quickly fading.

For the Soviet Union must be credited with the stockpiling of hydrogen bombs beginning in 1954 or shortly thereafter, and the contemporary appearance of their long-range turboprop (Bear) and jet (Bison) bombers represented a significant challenge to U.S. air supremacy. It was becoming clear that this Nation's geographic isolation could no longer protect it from direct and devastating attack, the speed and scale of which would deny it still another asset—the ability to mobilize decisive military strength after the outbreak of a major war.

If American industrial power could no longer be decisive after the onset of a war, it was still possible to believe that its peacetime exploitation could tip the balance of power decisively in our favor. The size and power of the Strategic Air Command itself seemed ample evidence of this ability to retain the lead, a lead so great that a Soviet attack on this Nation or its allies would be irrational, perhaps even unthinkable.

The subsequent effort to maintain this lead followed a familiar path. Primary reliance continued to be placed on the retaliatory threat of strategic airpower for the defense of our allies and the deterrence of a direct attack upon the United States itself. By 1956,

SAC's medium bomber force had attained a strength of 1,500 planes and a new long-range jet bomber, the B–52, was beginning to replace its propellered predecessor, the B–36. Advancing nuclear technology had produced smaller and lighter hydrogen bombs, enabling these planes to carry multiple loads. The potential power of SAC could be measured in hundreds of megatons at a time when 2 megatons were regarded as the explosive equivalent of "all the bombs dropped by all the bombers in World War II."

There were those who warned of placing heavy reliance upon a strategic force so vulnerable to surprise attack and, particularly, of dependence on SAC to deter an opponent both capable of such an attack and increasingly aware of its great advantages. But major effort had gone into the construction of radar early warning systems, and it was thought that SAC would receive warning of an attack hours before its own bases could be hit—warning of sufficient length to permit a massive retaliatory force to take off in safety. It was still possible to believe in the sufficiency, and even the supremacy, of U.S. nuclear-armed airpower.

C. THE NUCLEAR-MISSILE GENERATION

To the validity of the concepts outlined above, and to the American faith in the decisive superiority of this Nation's industrial and technical skills, the announcement of a successful Soviet ICBM test on August 26, 1957, came as a rude and unpleasant shock.

This event, followed by the launching of two surprisingly heavy Soviet earth satellites, marked the advent of the nuclear-missile weapons generation, and that the Soviets were first to achieve weapons of such importance was profoundly disturbing. As no other nation had missiles of this type, the Soviet achievement could hardly be attributed to espionage; there was no escaping the fact that, in this field at least, the Soviets had matched or even overcome our technical skills.

In addition to its effects on American prestige and complacency, the Soviet achievement held military implications that warranted a reappraisal of this country's defense posture. Primary reliance on the Strategic Air Command as a deterrent to Soviet attack rested on the assumption that SAC would receive sufficient warning of an attack on its bases to launch a sizable retaliatory force. The appearance of the intercontinental ballistic missile, of which there might be little attack warning and against which there was certainly no defense, shattered the conviction that SAC would receive warning of a surprise attack in time to be safely airborne.

Popular attention first focused on the ICBM as a city-busting weapon, a role for which the destructive power but limited accuracy of the early missile seemed ideally cast. But the far greater and more likely danger was that of a surprise Soviet missile strike against the U.S. strategic airbases. Such an attack would not have to promise total effectiveness to be tempting, as improved Soviet civil and air defenses might limit to tolerable levels the damage that nation could expect to receive from surviving remnants of the Strategic Air Command.

It is this Soviet temptation to strike first with missiles against our grounded strategic air force that is the major problem posed by the advent of the nuclear-missile weapons generation.

The early intercontinental missiles do not compare favorably with the present jet bombers in accuracy or destructive power, nor do they yet exist in numbers sufficient to dominate the strategic equation. But when, in the early 1960's, ICBM's will be present in numbers and with power and accuracy sufficient to make them the dominant strategic weapons, the United States may well confront the Soviet Union under conditions in which the Soviet advantages in military initiative and target intelligence may assume very great importance.

The Soviet intelligence advantage would of course be significant in a strategic weapons environment of bombers alone. Their closed society would make it difficult for us to obtain advanced knowledge of their preparations for attack, while our own society is vulnerable to the early detection of such activities; the massed departure of our planes, for example, would almost certainly be reported to Moscow. In this respect the Soviets are the more capable of taking their adversary by surprise.

The intelligence factor could also compensate for the relative weakness of the Soviet bomber force. While our own strategic airbases and secondary staging fields are easily identified, the Air Force has never claimed with an assurance that inspires confidence that the same is true of their Soviet counterparts.[22]

Once missiles are introduced the importance of the Soviet intelligence advantage assumes almost staggering proportions at a time when U.S. strategic power remains centered in a manned bomber force. While the Strategic Air Command might now receive no warning whatsoever of a missile attack, and may never get more than the 15 to 20 minutes warning that sophisticated radars may provide, there is even less chance that a majority of the Soviet missile bases can be located in advance of a war.[23] It thus becomes exceedingly doubtful that the Soviet missile force could be effectively attacked by an American first strike or one in retaliation for Soviet aggression against one of our allies.

While the bulk of the present U.S. bomber fleet is certain to be replaced by missiles of lesser vulnerability during the next decade, the Soviets are likely to retain the advantage of knowing the location of our fixed strategic bases. As if to increase this Soviet advantage, the locations of U.S. missile sites, radar-warning installations, air-defense facilities, and naval communication centers are being widely publicized long before they are even built.

D. THE NUCLEAR-MISSILE GENERATION: TWO STAGES

As small numbers of ICBM's become operational on both sides of the Iron Curtain, the initial stage of the nuclear-missile generation is

[22] The Air Force Chief of Staff, Gen. Thomas D. White, has given this summary of his target intelligence: "We do know where their major airbases are; where their major Government control centers are; where their air defense centers are; where their sensitive industrial targets are; where their gasoline refineries and storage sites are, so on that basis we have accurate knowledge of the targets. The problem of locating missile sites is before us, and it is going to be a very difficult problem." House Hearings on Fiscal Year 1960 Defense Budget, Feb. 17, 1959, pt. I, p. 840.

[23] The utility of spy satellites and other space reconnaissance systems in this regard is discussed in the following chapter. They do not now appear to promise the quantity and quality of information needed to balance Soviet and American intelligence capabilities.

being characterized by a drastic compression in the time required for delivery of nuclear weapons at intercontinental ranges, a consequent reduction in the warning time available to a defender, and the mounting importance of target intelligence. These characteristics, added to the fact that there is now no defense whatsoever against an ICBM in flight, greatly increase the vulnerability of manned bombers to surprise attack by the side that first achieves a comprehensive missile strike force. That side would gain, temporarily at least, a dominant first-strike capability.

There is no doubt that the Strategic Air Command still enjoys a a marked first-strike advantage over its strategic adversary, the Soviet Dal'naia Aviatsiia (long-range aviation) or DA, because of its ability to destroy much of the Soviet bomber force on the ground. This ability to destroy or gravely weaken the enemy's strategic attack force before it can be effectively employed is called "counterforce capability" and constitutes a crucial element in the strategic equation. If the Soviets achieved the first comprehensive missile strike force, while our own strategic power rested largely on bombers, the first-strike advantage would abruptly be transferred to them. With their acknowledged advantage in target intelligence and the advanced civil and air defense systems with which they are often credited, a surprise Soviet missile strike might so reduce SAC's effectiveness that the Russian homeland could survive a retaliatory strike by the remaining U.S. planes.

It is this possibility of a transfer of first-strike capability to the Soviets that disturbs those who see in the looming "missile gap" [24] the greatest danger to its security that the United States has ever faced. A number of measures to delay or even to prevent such an abrupt transfer of military advantage have been suggested; they include greater dispersal of SAC's bombers, hardening or otherwise giving at least partial protection to strategic airbases, placing a larger number of planes on an alert or quick reaction status, and the decentralization and hardening of communication and warning systems. Limited programs are now being implemented in these areas with the objective of increasing the number of missiles that the Soviets would require for a successful first strike, and decreasing Soviet confidence that such an attack could reduce SAC to tolerable size.

Other measures seek to maintain SAC's ability to penetrate Soviet air defenses, so that even a greatly diminished bomber force could pose a major retaliatory threat. These include various means of confusing or disrupting defensive radars by electronic countermeasures (ECM), jamming and decoys, as well as means of striking at air defense systems or overreaching them, with air-launched ballistic missiles that can be fired at their targets from a point hundreds of miles away.

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[24] The "missile gap" is commonly defined as a probable Soviet lead in numbers of ICBM's during the early and middle 1960's, a lead that may neutralize the U.S. strategic deterrent. A recent article by Joseph Alsop gives "the best official forecast" of U.S./U.S.S.R. missile force levels in this period as 30 versus 100 missiles in 1960; 70 versus 500 in 1961; 130 versus 1,000 in 1962 and 1,500 in 1963. Alsop estimates that the missile gap will remain a period of critical danger until it is closed by the mass production of U.S. solid fuel ICBM's in 1965–66. (See "After Ike, the Deluge," a copyrighted article published in the Washington Post and Times Herald, Oct. 7, 1959, p. A17.) Cf. Brig. Gen. Thomas R. Phillips (U.S. Army, retired), "The Growing Missile Gap," the Reporter, vol. XX, No. 1, Jan. 8, 1959, pp 10–16.

These efforts are essential supplements to the task of preventing the Soviets from tipping the strategic balance in their favor before this country can create a strategic missile force less vulnerable to surprise attack than SAC's present bombers. While the adoption of these measures cannot guarantee preservation of the currently assumed U.S. first-strike advantage, they may at least prevent its loss to the enemy.

It must be anticipated that the Soviets will place their own ICBM's in hardened and, later, mobile launching sites,[25] to protect them from enemy attack as the U.S. plans to do. In time, therefore, the strategic forces of both adversaries may present targets too numerous and protected to be destroyed, or even greatly diminished, by a surprise attack; at the very least, the multiplication and hardening or mobilizing of missile sites will reduce the confidence either side would be able to place in the effectiveness of a surprise attack on the opposing strategic forces.[26] Should this occur, the nuclear-missile weapons generation would enter a second stage, one characterized by the mutual possession of relatively secure strategic systems and the related and mutual loss of the ability to execute an effective first strike against the opponent's missile force.

In this respect the characteristics of anticipated strategic weapons may result in a more stable balance of strategic forces, one in which the Soviet Union is deterred from a surprise attack on the United States (and the United States deterred from credibly threatening to attack the Soviet Union) by a mutual inability to destroy the opposing retaliatory missiles in even a surprise attack. Such a condition of qualified mutual deterrence, or nuclear stalemate, is conditional on the number and relative vulnerability of the missile systems possessed by both adversaries and, as will be later examined, the shifting status of missile technology. It would be a mistake of the most serious proportions to consider the reaching of such a stalemate as assured, or to count on its permanence in an era of exponential progress in military technology.

The possible nature and implications of this prospective stability are of sufficient complexity and consequence to the United States that they will be the subject of a later section; the remainder of this chapter will examine more fully the initial or transitional phase of the nuclear-missile weapons generation and its strategic implications.

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[25] The present U.S. and known Soviet ICBM's require complex testing and liquid fueling immediately prior to launching and must therefore be placed in fixed sites with the necessary support equipment. Their height and weight, approximating 85 feet and 100 tons, respectively, also preclude a significant degree of mobility. U.S. fixed ICBM sites are being buried and armored, or hardened, with concrete to protect them insofar as is practical from the blast effects of enemy warheads.

The anticipated second generation ICBM's will utilize solid fuel and be of smaller size and weight, thus facilitating their mass production and mobile siting on a scale not now possible. Due to the limitations of present and anticipated solid missile fuels, however, the warhead of these second generation ICBM's is expected to have one-quarter to one-eighth the destructive power of their liquid-fueled predecessors. A U.S. missile of this second-generation type, the Minuteman, is expected to be operational in 1963.

[26] Air Force spokesmen often stress the desirability of maintaining a counterforce ability against the Soviet strategic forces, but express considerable uncertainty about its practicality in a weapons environment of hidden and hardened ICBM's. The counterforce problem, Lt. Gen. C. S. Irvine told Congress last spring, "* * * is a problem we look at with considerable apprehension and misgiving and it is one of the reasons we want to get as accurate a missile as we can. We hope we can do a better job than our opposition and that our use of tactics is better than his." House Hearings on Fiscal Year 1960 Defense Budget, pt. 5, Apr. 10, 1959, p. 636. Obstacles to effectively "taking out" an enemy missile force include limitations of target intelligence and the restricted accuracy and destructive power of the present ICBM's.

E. RISKS AND PROSPECTS OF THE MISSILE GAP

It is the transitional phase of the nuclear-missile weapons generation, between the present predominance of the long-range bomber and the future predominance of the ICBM, that holds the gravest immediate danger for the United States. Varied estimates have been made of when the Soviets will have accumulated ICBM's of sufficient number and accuracy to consider practical a surprise attack on bases of the Strategic Air Command, but many qualified observers place this date in the early 1960's.[27]

As this country has officially conceded a numerical missile lead in this period to the Soviets,[28] immediate attention focuses on the race between Soviet achievement of a minimum missile strike force and the completion of a U.S. missile warning system, or systems, that may give the Strategic Air Command from 10 to 20 minutes notice of oncoming missiles. Two such radar systems, the Air Force's Ballistic Missile Early Warning System (BMEWS) and the newer Navy project Tepee are now under construction. Some published estimates predict BMEWS will be in operation in 1960–61. A more radical missile defense alarm system, identified by the code name Midas, visualizes the use of satellite-mounted infrared sensors to detect the hot exhaust gases of rising missiles, but is still in the research and development stage.

The purpose of these systems is to provide alert forces of SAC's bombers with enough warning time for them to gain protection by taking off from their bases. The importance of such a warning, given the absence of any effective active defense against incoming ICBM's, cannot be overestimated. As SAC's commander recently testified:

> If I get no warning of this attack, I have zero capability right at this minute, that is, provided they have the capability to destroy my forces on the ground. You have to first tell me how much warning I am getting of this attack. This is the thing that changes everything.[29]

For the interim period before such warning systems become operational the Air Force is considering plans to keep a small number of bomb-loaded long-range aircraft continuously airborne as a protection against surprise missile attack on their bases. Preliminary tests indicate that 90 percent of the airborne planes could be kept within range of their targets, but that it would be very difficult to keep even as much as a third of the long-range strategic bomber force on air

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[27] The Air Force Chief of Staff, for example, has said that the Soviets may acquire sufficient missile strength in 1960 to require a protective airborne alert for a portion of SAC's retaliatory bombers. House Hearings on Fiscal Year 1960 Defense Budget, pt. 1, Feb. 18, 1959, Gen. Thomas D. White, pp. 864, 865. Maj. Gen. Bernard A. Schriever, Commander of the Air Force's Ballistic Missile Division, said the Soviets could achieve the capability of launching relatively large numbers of missiles in salvo by 1962 or 1963, which he characterized as the period of maximum danger to the United States. House Hearings on Fiscal Year 1960 Defense Budget, pt. 5, April 9, 1959, pp. 709, 724.

[28] As Secretary of Defense Neil McElroy told Congress last January: "It is not our policy to try to match missile for missile in the ICBM category of the Russian capability in the next couple of years. Our position * * * is that our diversified capability to deliver the big weapon is what we are going to count on as our ability to deter general war." The Secretary added "* * * down the road we expect him to have the capability to do more than we intend under our programing to do for ourselves in the strictly ICBM area" and was later quoted as estimating the possible Soviet missile lead at 3 to 1. See James R. Shepley, "Life and Death Debate Over Missile Program," Life magazine, Mar. 9, 1959, p. 116 ff. Shepley states that the Soviets are assumed to be capable of 500 ICBM's by 1962 compared to a programmed force of some 200 U.S. ICBM's by mid-1963. Cf. Alsop, cited above.

[29] House Hearings on Fiscal Year 1960 Defense Budget, pt. 2, Feb. 13, 1959, Gen. Thomas S. Power, p. 404.

alert, presumably because of a shortage of trained crews. The cost of such a system, in additional fuel and maintenance alone, has been estimated by the Air Force at up to $1.2 billion annually.[30]

From the obvious limitations and uncertain timing of these protective expedients, it appears that the principal obstacles to a Soviet surprise attack in the missile gap period are not those of weapon limitations but arise from the practical difficulty of effectively destroying a large number of dispersed targets almost simultaneously, a feat necessary in order to prevent a retaliatory counterattack of major proportions on the Soviet Union. These targets include SAC's overseas bases, NATO tactical air forces whose planes can deliver nuclear weapons against Soviet targets of strategic importance, a handful of intermediate range missile sites in Western Europe and Britain, and those U.S. naval carriers in position to launch strategic attacks. The number of these weapons that might escape destruction from Soviet missiles and aircraft—added to that fraction of the domestic SAC forces surviving the attack—poses a retaliatory threat that should introduce a note of caution into Soviet calculations. No sane government would view lightly the placing of even a dozen thermonuclear bombs on its major cities.

The execution of a coordinated surprise attack presents an additional element of uncertainty, as many of the preparatory moves could give the show away if misphased. If the first Soviet intermediate range missiles, for example, struck one of our overseas airbases even 20 minutes ahead of an ICBM strike against SAC's domestic fields, a force of several hundred U.S. bombers (now on 15-minute "ground alert") could be airborne and on their way to Soviet targets before their bases were destroyed. The scheme could also be disclosed by unusual patterns of Soviet civil defense activity or a concentration of missile submarines within range of U.S. targets.

These uncertainties will reduce, though they cannot eliminate, the temptations to the Soviets of a surprise attack on SAC's airbases during the "transitional" phase of the nuclear-missile weapons generation. It is important to remember, however, that during this period there are also serious obstacles to a U.S. retaliatory strike and therefore to the credibility of the American threat of retaliation as a deterrent to attack.[31] SAC will remain a force highly vulnerable to missiles for years to come; the Air Force has estimated that SAC's retaliatory strength could be reduced to one-third of its prehostilities force by yielding to the Soviets the advantage of the first strike. The retaliatory strength of this residual force is further diminished by the increasing effectiveness of Soviet air defense systems, which have already forced SAC to sacrifice bomb payloads in order to carry the necessary penetration aids.[32]

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[30] House Hearings on Fiscal Year 1960 Defense Budget, pt. 1, Gen. Thomas D. White, p. 985.

[31] Cf. Albert Wohlstetter, "The Delicate Balance of Terror," Foreign Affairs, vol. XXXVII, No. 2 (January 1959), pp. 211–234.

[32] These include radar jamming devices, anti-radar air-to-surface missiles and decoys simulating the radar echoes of bombers. It is of note that funds for Air Force procurement of electronic countermeasure equipment were more than doubled during fiscal 1959, rising from $95 to $196.5 million. The major portion went into defensive ECM equipment. The Air Force's Director of Material Programs testified in this connection: "This ECM program reflects our reaction to the enemy's radar threat * * *. In that time period (post-1960) we must be able to counter advanced enemy defense systems of increased numbers, more diversified frequencies, higher power, and systems incorporating countermeasures circuitry." House Hearings on Fiscal Year 1960 Defense Budget, pt. 5, Apr. 13, 1959, Col. C. W. Andrews, p. 590.

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The damage that a remnant SAC force could inflict on the Soviet Union in a retaliatory strike would be further reduced by Soviet civil defense preparations. In contrast to those of this country, these are now said to be pursued with increasing intensity and realism.[33] The possibility that the Soviets could minimize losses from our retaliation by synchronizing their attack with an apparently routine training evacuation of their major cities cannot be lightly dismissed.

Reliance on the deterrent value of NATO airpower and carrier-launched aircraft can be but minimal in view of the vulnerability of these weapons to existing Soviet missile systems. The early U.S. ICBM's, furthermore, will add little to this country's deterrent posture in view of their limited number and known locations.

It therefore appears highly unlikely that this dangerous transitional period can be much shortened or that it will be possible to close the anticipated missile gap in the early 1960's. A serious limiting factor is the time required to perfect and deploy major weapons systems; the recent 2-month setback in the Atlas ICBM and 6-month setback in the Thor IRBM operational dates are illustrative of this problem. The leadtime for the training of an ICBM crew is now approximately 1 year, that for construction of a hardened ICBM squadron base 18 months, and that for construction of a missile submarine 30 to 36 months.[34]

Current U.S. missile programs should result in an inventory of slightly more than 100 operational ICBM's by the end of 1962. The Soviets are credited with the ability to have several times that number deployed by then. With even a crash program of base construction, it is difficult to imagine how the U.S. force could be increased to more than 300 missiles by 1963 (in comparison to a possible[35] Soviet inventory of 1,000 or even more). The military utility of this limited U.S. force will be further restricted by problems of mechanical reliability. Optimistic appraisers of our early liquid fuel missiles credit them with 80-percent reliability; more pessimistic authorities believe that little more than 50 percent of the missiles launched can be expected to land in the general vicinity of their targets. Reliability can of course be expected to improve with experience and engineering refinements, but the length and sequential nature of Soviet missle development programs can be expected to give them an advantage in this regard.

A mobile base missile system, that of nuclear submarines armed with Polaris intermediate-range missiles, has been widely heralded as a deterrent-retaliatory system of great potential in the years ahead.[36] Advantages generally claimed for this Fleet Ballistic Missile

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[33] See "Civil Defense in Western Europe and the Soviet Union." Fifth report by the Committee on Government Operations, H. Rept. 300, 86th Cong., 1st sess., Apr. 27, 1959.

[34] The ICBM crew and base construction leadtimes given are trade press estimates; that for construction of a ballistic missile submarine as given by the Navy. See House Hearings on Fiscal Year 1960 Defense Budget, pt. 5, Apr. 6, 1959, Rear Adm. W. F. Raborn, p. 288. Long leadtime components of these and other nuclear-powered submarines include powerplant, fire control and navigational systems.

[35] The qualification must be emphasized, as published estimates of Soviet missile inventories for this period range from totals of 3 to 10 times the programmed U.S. force. The variance in these estimates, as in those of present Soviet ICBM force levels, illustrates the intelligence asymmetry between the two adversaries.

[36] For a representative naval views see Comdr. P. H. Backus (U.S. Navy), "Finite Deterrence, Controlled Retaliation," U.S. Naval Institute Proceedings, vol. 85, No. 3, March 1959, p. 25. The deterrent utility of sea-based retaliatory systems is further explored by Oskar Morgenstern, "The Game Theory in U.S. Strategy," Fortune, vol. LX, No. 3, September 1959, p. 126 ff. Both articles make the implicit assumption that submarine detection devices will remain at their present relatively low levels of capability.

System are a relative immunity from location by the enemy and the fact that such a system could draw enemy atomic fires away from, rather than toward, the continental United States. Opposing but far from outweighing these advantages are the anticipated low order of accuracy and destructive power of the Polaris missile relative to liquid fuel ICBM's and the inutility of the system in any conflict other than all-out nuclear war.

Although the first Polaris submarine is still far from reaching operational status, there is much that can be said for systems of this type. Mobile strategic weapons could become the only realistic deterrents to nuclear attack should ICBM accuracy so improve as to make possible low missile-to-target ratios. The number of Polaris submarines which will, or even could, be made available by 1962–63, however, is too small for such a force to be considered an important supplementary deterrent in the missile gap period.[37]

Indeed the most discouraging aspect of the missile gap is that we seem unable to escape it should the Soviets produce the number of ICBM's of which they are believed capable. Estimates of this Soviet capability and intention may of course turn out to be as greatly exaggerated as those estimates of Russian bomber production given Congress but 3 years ago. Now, as then, it would be the safer course to overbuild our deterrent power than not to do enough. This choice, as it affects the early years of the missile gap period, is no longer open to the United States.

F. THE NUCLEAR-MISSILE GENERATION: A LATER STAGE

At the present and predicted levels of military-technological attainment the only "invulnerable" weapons system is one unknown to the enemy, and such a system, by definition, would have no deterrent effects. Some weapons systems are, however, much less vulnerable than others to attack by existing or anticipated means and it now appears that development of such relatively secure striking forces will characterize a later stage of the nuclear-missile weapons generation in the mid-1960's and possibly even beyond.

The traditional military means of achieving such relative security are armor or cover, concealment, dispersal, mobility, and the multiplication of weapons. Early U.S. ICBM sites will have cover, in the form of hardening, but neither mobility nor concealment other than that provided by the sheer size of the military reservations on which they will be located. A more advanced missile system, the Polaris submarine earlier described, will exploit all of these protective techniques with the possible exception of cover. Mobility can be given to the second-generation ICBM's, such as the solid fuel U.S. Minuteman [38] anticipated in 1963–64, and all missiles can be given the partial

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[37] Funds for nine Polaris submarines have been appropriated. The first is hoped to be operational in 1960, four more by July of 1961, and the remaining four by the end of 1963. Navy spokesmen have referred to a planning objective of 40 such submarines by 1970, a force level which appears appropriate to the utility of the system.

[38] The Air Force is considering plans to mount perhaps half of a large Minuteman force on trucks, river barges, and special missile trains. This form of protection is considered more expensive than hardening and dispersal, however, and it is expected that the missiles could only be fired from presurveyed locations. See House Hearings on Fiscal Year 1960 Defense Budget, pt. 5, Apr. 9, 1959, Maj. Gen. Bernard A. Schriever, pp. 685–686. See also, William E. Howard, "Minuteman Rail Concept Pushed," Missiles and Rockets, June 1959, pp. 19–20.

protection of dispersal.[39] The same techniques can be applied to other strategic systems now under development; long-range bombers on air alert can, for example, take maximum advantage of protective mobility and would have partial concealment from the enemy under certain operating conditions.

None of these expedients can provide "invulnerability" in the sense of absolute security from attack. Concealment and mobility can be overcome by espionage or the use of electronic devices such as radar and sonar. Artificial concealment (camouflage) can be penetrated by a variety of sensor systems, including infrared aerial photography. Cover, even that well beyond the current U.S. ICBM site hardening standard of 100 pounds per square inch overpressure, can be nullified by the ground shock effects of multimegaton weapons or destroyed by "cratering" a target with the same weapons. Even a deep-running nuclear submarine may be betrayed by the great distances over which its own sound, and the shock waves generated by nuclear explosions underwater, can be transmitted. The purpose of these expedients, therefore, is not to provide individual retaliatory weapons with complete protection from attack. It is instead—by making it more difficult for the enemy to locate, identify, and destroy these systems—to increase greatly the power, sophistication, and number of weapons that an aggressor would require to overcome them. While an uncovered, unconcealed, and obviously nonmobile airfield, for example, could be destroyed by four to six ICBM's of the accuracy and warhead power assumed to be within initial Soviet capabilities, destruction of a single hardened missile launching site may require as many as 30 to 40 missiles of similar refinement and explosive power.[40] Thus if a single 10-missile squadron is sufficiently dispersed so that each of its "birds" must be individually attacked, the total size of the attack must be increased some fiftyfold over that required for destruction of a SAC base.

The exploitation of dispersal, mobility, cover, and concealment by anticipated strategic weapons systems may also compel the potential aggressor to devote great effort and resources to capabilities he has been neglecting, and even to develop entirely new offensive and defensive systems. Missile-launching submarines, if constructed in adequate numbers, would tend to stimulate Soviet interest and activity in anti-submarine warfare devices, thus detracting from their efforts

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[39] The initial Atlas ICBM squadrons will be neither hardened nor adequately dispersed, a sacrifice made to achieve the earliest possible operational capability. It has been stated that at least the last 5 Atlas squadrons, and all 11 of the programmed Titan ICBM squadrons, will be both dispersed and hardened to 100 per square inch overpressure.

[40] These estimates are based on conversations with authorities in the missile field. Compare those given by Charles V. Murphy in his "The Embattled Mr. McElroy," Fortune, vol. LIX, No. 4, April 1959, pp. 147 ff. Assuming a Soviet ICBM of high reliability, a 2-megaton warhead and an accuracy (CEP) of less than 2 miles by 1962, Murphy estimates on the basis of information made available by the Air Force that at least 14 such missiles would have to be launched at a hardened U.S. ICBM site to provide a 90-percent probability of its destruction. The programmed U.S. force of 110 hardened and dispersed Titan missiles would therefore call for a salvo of 1,500 missiles to destroy them.

It is important to note, however, that the number of attacking missiles required for such a counterforce attack varies inversely with their accuracy. Murphy states that if the Soviets were credited only with a missile accuracy of 3 miles by 1962, the other factors remaining the same, the number required to assure the destruction of a single Titan site would increase from 14 to nearly 60 and the total number needed to "take out" the Titan force from 1,500 to 6,000.

in other areas.[41] U.S. development of an air-launched ballistic missile with a range of 1,000 miles or more[42] could require the U.S.S.R. to develop interceptor aircraft and ground-to-air missiles of far greater range than those currently available. Introduction of the ICBM, of course, has already compelled both adversaries to divert considerable economic and scientific resources to the development of missile defense systems.

The hoped-for effect of these efforts to complicate the attacker's task and to increase the burden on his resources is to continually postpone the day on which he might believe his forces adequate to take out his adversary's strategic power in a surprise attack. Its effectiveness in this regard is the measure of a retaliatory weapons system. Efforts to harden, disperse, conceal and "mobilize" U.S. retaliatory forces of the 1960's may be expected to increase the number of ICBM's that the Soviets would require for an effective first strike from a few hundred to as much as many thousands. Each addition to the size and security of our retaliatory forces can in this manner compel the Soviets to multiply their offensive weapons should they hope to strike at the United States without suffering patently intolerable levels of retaliatory destruction.

A second contrast between the attacker's military requirements and those of his potential victim favors the attainment of an adequate retaliatory posture by the United States in this later phase. While the primary target of a rational first strike must be the adversary's retaliatory force, the objective of the defender's retaliatory or second strike can be limited to the aggressor's population and industry, although the threat of such a target strategy might not seem credible to the opponent and its deterrent effect be thereby diminished.[43] In other words, before the aggressor can rationally launch a surprise attack he must at least be capable of reducing his victim's strategic force to extremely low levels while the potential victim, to deter the attack, need only be capable of imposing unacceptable losses on civilian concentrations in the aggressors' domain that are far more vulnerable to nuclear attack than are his own strategic forces—the deterrer can far more effectively disperse, harden and even conceal his retaliatory weapons systems than can the attacker his cities and industries.[44]

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[41] A example of this bonus effect from the employment, or threatened employment, of diversified weapons systems is provided by the German use of magnetic mines in World War II. The purpose of these mines was not only to sink Allied shipping "but to force the enemy to spend enormous sums of money and to use valuable ships and valuable copper in mine sweeping and degaussing. The incidental nuisance value in closing harbors and forcing the enemy thus to use his resources was perhaps as valuable as the actual sinkings." Francis Bitter, "Magnets: The Education of a Physicist," Doubleday & Co., Inc., Garden City, N.Y., 1959, p. 122.

[42] This is the commonly mentioned range objective of the U.S. ALBM now under development. See, for example, "Air Force Missiles of the Future," Missiles and Rockets, July 20, 1959, p. 147. One source predicts that U.S. deployment of ALBM-armed jet bombers on the Russian periphery may compel the Soviets to extend their air defense systems into the polar regions and open seas, involving them (and one would assume the United States) in "political problems." See Claude Witze, "Can Jet Bombers Armed with Air-Launched Ballistic Missiles Make SAC Too Tough To Tackle?" Air Force magazine, February 1959, p. 36 ff.

[43] See below, pp. 107–108.

[44] A strategy of "finite" or "minimum" deterrence, limited to the threat and capability of destroying between 100 and 200 Soviet civilian concentrations, has been advocated by several Navy spokesmen, of which Commander Backus, op. cit., is perhaps the most coherent. Critics of the proposal have emphasized the difficulty of defining what might constitute a "minimum deterrent" in Soviet thinking and the military inutility of striking solely at Soviet cities in a retaliatory attack. The controversy has emphasized the differences between strategies for deterring a war and for fighting one. For critical views

An additional disparity favoring the deterrer is that the attacker must have a very high order of confidence in his ability to destroy most of the opposing strategic force while his potential victim, in order to discourage the attack, need only make it appear probable that the attack will not meet with the necessary degree of success. Even if the attacker estimates that the effectiveness of his strike on the adversary's strategic force will be as high as 90 percent, he still faces such uncertainties as that of errors in the coordination of his strike, unforeseen defense tactics and weapons in the hands of his enemy and that of outdated or faulty target intelligence. Thus any substantial doubt whether the first blow will be highly successful, coupled with the great vulnerability differential between the attacker's targets and those of the retaliator, should increasingly tend to rob the initiation of total nuclear war of its attractiveness as a rational instrument of military policy.

It is in this context that the anticipated strategic weapons of the middle 1960's can lend a measure of stability to the strategic balance. As both adversaries achieve a degree of security for their strategic forces, a surprise attack on the opposing force will become increasingly hazardous, if not foolhardy, and much of the present incentive to strike first will vanish. In such a weapons environment the Soviet advantages in military intelligence and strategic initiative could lose much of the importance they now possess and the present danger of total nuclear war be greatly reduced. It bears reemphasis that this measure of stability would stem from a variety of factors operating to reduce the rationality, and therefore the probability of a nuclear first strike, not from technological invention that could make the delivery of nuclear weapons impossible. Stability in this qualified sense cannot be equated with physical security from atomic attack; the prospect of the two great adversaries facing each other with hundreds of relatively secure but highly destructive weapons (that can be launched in the span of a few minutes) may be attractive in terms of our present predicament, but is hardly a comforting prospect.

To achieve even this measure of stability, moreover, will not be an easy task. In addition to the technological obstacles that must be overcome in the development of mobile and relatively protected weapons systems, the high unit cost of supplementary and diversionary strategic weapons tends to inhibit their procurement in sufficient quantities to affect the enemy. Even that degree of stability which now appears achievable in this later phase of the nuclear-missile weapons generation may prove ephemeral in the light of accelerating technological development, as presently unforeseen weapons may once again alter strategic capabilities and the distribution of military power.

Breakthroughs of a magnitude comparable to the advent of atomic and hydrogen bombs now seem unlikely, though they are not inconceivable. If the Soviet Union or the United States developed a missile so accurate and reliable as to render possible something approaching a 1:1 missile-to-target ratio, the nation so doing could ac-

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on finite deterrence see the testimony of Gen. Thomas S. Power, House Hearings on Fiscal Year 1960 Defense Budget, pt. 2, Feb. 13, 1959, pp. 374–382, and Joseph Alsop, "Twaddle of a Far Different Kind," The Washington Post and Times Herald, Mar. 1, 1959. The background of this controversy, and its relation to weapons systems of the Navy and Air Force, is examined by Hanson W. Baldwin in "Pentagon Problems—I," The New York Times, May 4, 1959, p. 23.

quire a crippling first-strike capability against even a highly protected retaliatory force. We would thus be ill-advised to look upon any phase of the arms race as a terminal point rather than as a way-station. It is the purpose of the following chapter to assess some more advanced technological possibilities both in this respect and in terms of the military and political problems to which they may give rise.

Chapter 4. The Prospects of New Weapons Generations

The prediction of weapon possibilities beyond those of the early intercontinental missiles is a field upon which guesses are the horses that strategists must often ride. The sharp controversy that surrounds appraisal of even the now-emerging space systems [45] suggests the difficulties of assessing those of the future.

The object here will be to further refine the concept of a weapons generation, then apply it to those whose arrival has been authoritatively prophesied for the next decade. The emphasis will be on the strategic significance of nuclear-missile outgrowths, toxicological weapons, and on the possible utility of systems employing both satellite and manned-maneuverable space vehicles. No attempt is made to provide a comprehensive study of development trends in all major weapon fields, or of the detailed problems and possibilities of space exploitation, as these objectives have been admirably accomplished elsewhere.[46]

A. THE CONCEPT OF A WEAPONS GENERATION

The dramatic advances made in the performance of strategic weapons since World War II illustrates our weapons generation concept, for the accelerating rate of technological progress has resulted in almost equally rapid weapon obsolescence, giving each of the two great powers repeated chances of seizing an important if temporary lead in the arms race.

A corollary effect has been that of shrinking the earth for military purposes, bringing both adversaries—and indeed any nations able to beg, buy, build or borrow the newer strategic weapons—into effective and threatening military proximity.

A relevant comparison here is that between the B–29 strategic bomber used against the Japanese home islands in 1945, and the Atlas intercontinental ballistic missile declared operational by the United States on September 1 of this year. The bomber was capable of carrying a 10-ton payload, of which not much more than a third was actual explosive, at 300 miles per hour speeds over a radius of operation that could not much exceed 2,000 miles. In contrast, the first operational Atlas is credited with moving at least a million tons of explosive (measured in TNT equivalence) at speeds up to 15,000

[45] This trade press comment was recently made on the Air Force's projected boost-glide vehicle, the Dynasoar: "Probably no aerial weapon since the Wright biplane has come into the military planning picture with as little understanding and agreement about its optimum mode of operation, its attack and reconnaissance potential and its limitations." J. S. Blutz, Jr., "Hypersonic Vehicle Will Face Technical Cost Problems," Aviation Week, June 22, 1959, p. 159 ff.

[46] See, for example, the National Planning Association's report on "1970 Without Arms Control" (Planning Pamphlet No. 104, May 1958) for a concise and compact survey of development trends in major areas of weaponry. The Rand Corp. report, "Space Handbook: Astronautics and Its Applications," is perhaps the best single survey of major problems and possibilities of space exploitation.

miles per hour over ranges of 5,000 to 6,000 miles. The comparison is not this favorable to the missile, which suffers from accuracy and reliability shortcomings at its present stage of development, but the fact remains that the destructive power of a single strategic delivery vehicle has been multiplied by a factor of almost 1 million, delivery speed by 50 and range by 3 in that brief period of time. The ICBM has, in addition, made the bomber an extremely vulnerable target on its home base, as examined in the previous chapter.

Progress of this nature, stemming from the development of radically new weapons systems, has afforded the newcomer opportunities to force his way into the top rank that would not have been available to him otherwise. It is extremely doubtful, for example, whether the Soviets could have matched and overcome the American lead in the manufacture and employment experience of strategic aircraft had the arms race remained on that course. On the basis of this experience one might conclude that a new weapons generation comes into being when (*a*) new technological developments threaten existing strategic attack systems with obsolescence, thus presenting each of the superpowers with the opportunity of getting a fresh start in the arms competition, or (*b*) when developments in weapon technology so alter the importance of assets upon which military power is based that the strategic balance resting on earlier weapons generations is substantially changed.

The transition from the "conventional" generation through the nuclear to the nuclear-missile generation can be measured by the advancement in these weapon characteristics: (1) their destructive force, the (2) range and (3) speed of their delivery vehicles, with (4) accuracy playing an important but subordinate role. "Mobility" is the remaining performance characteristic usually cited, but there are others which affect the military utility of today's complex strategic weapons systems. Among these are their costs (initial, operating, and support) which determine how many units may be purchased and deployed, and at what sacrifice of other systems. Equally important are their manning requirements in terms of the number of men, their qualifications, and the training leadtime they need to operate the system.

Maintenance and supply requirements (logistics) may also be critical, in addition to the system's control and communication requirements and the target intelligence necessary for its effective employment.

New weapons generations, as the term is here employed, may come about as a consequence of radical progress in these areas, as well as advances in the three critical parameters of destructive force, range, and speed. The belated adoption of firearms by English forces in the 16th century provides a precedent, for the small arms then available were not superior in performance to the longbow (which had equal range and was far more accurate and quick firing). Their great advantage was that almost anyone could be trained to use them quickly in contrast to the years of practice needed to acquire a longbowman's skill.

It may also be suggested that the primary advantage of the early airplane over artillery for close support of the troops was not its speed, range, or firepower but rather in its mobility and the fact that it com-

bined its weapons with the intelligence capability needed to give them maximum effectiveness. (The greatly increased speed of present aircraft has tended to reduce their utility in this respect, even when they are directed from the ground.)

It is clear that the intelligence requirements of strategic attack systems are becoming particularly significant with the advent of the ballistic missile, as are the communications facilities needed for their effective use. The prospects of a new weapons generation can now be explored in terms of technological progress affecting these characteristics of strategic attack systems.

B. PROSPECT OF A NEW WEAPONS GENERATION AS AN OUTGROWTH OF EXISTING SYSTEMS

One must first assess the prospects of a new weapons generation stemming from extension of the speed, range, and destructive force of existing strategic systems.

Nuclear weapons far more destructive than those now available are certainly possible, as are those of equivalent power but of much smaller size and weight.[47] The possibility of doubling or tripling the power of aircraft nuclear bombs to, say, 40 or 60 megatons, has been mentioned, and transportation of a 100-megaton bomb declared feasible with major improvements in powerplants.[48] While the military utility of such superbombs has been questioned on grounds that a single existing bomb can already "take out" an entire city, their value would no doubt lie in their effectiveness against superhardened military targets and in the small number of them that could wreak havoc on an enemy nation,[49] the latter advantage being of obvious importance to the side wishing to deter attack.

Advances in nuclear weapon technology in other directions have also been predicted. Among them are "cleaner" warheads which produce less residual radiation, the "seeding" of existing weapons with radioactive materials of greater intensity, and sophisticated "small" warheads that depend upon radiation rather than blast and heat for their military effect.[50] These last are relevant primarily to tactical rather than to strategic applications.

On the whole, however, it is difficult to see how any of these predicted developments could have sufficient impact on the strategic equation to class them as a new weapons generation.

The same can be said for what seems a more likely and significant nuclear development, a reduction in the cost and a consequent increase in the availability of nuclear weapons. This may come as a consequence of the multiplication of reactors employed for power generation; the production of plutonium by this means is relatively slow but will be speeded if breeder reactors prove practical.[51]

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[47] The Deputy Director of Research and Engineering, Department of Defense, has said it now seems possible to develop the proverbial suitcase-sized atom bomb in a weight that one man could carry. Howard A. Wilcox, "Weapons, Science, and Civilization," Astronautics, vol. 4, No. 8, August 1959, p. 81.

[48] Ralph E. Lapp, "Fallout and Home Defense," Bulletin of the Atomic Scientists, vol. XV, No. 5, May 1959, p. 188.

[49] See the discussion of this potential in the National Planning Association's report, "1970 Without Arms Control," Planning Pamphlet No. 104, May 1958, pp. 15–16.

[50] See Edward Gamarekian, "New A-Bomb 'Pinpoints' Lethal Dose," The Washington Post and Times Herald, July 19, 1959, p. 1.

[51] Willard F. Libby, "Nuclear Energy—Some New Aspects," Bulletin of the Atomic Scientists, vol. XV, No. 6, June 1959, p. 241.

Other predicted developments promise a drastic reduction in the economic and material cost of nuclear weapons. One would be the attainment of controlled thermonuclear reactions, an effort upon which the three nuclear powers are now concentrating. Such a process would provide "cheap neutrons" aplenty and shrink the manufacturing costs of nuclear material. A way may also be found to bring about fusion reactions, for weapon use, without the priming fission stage to provide the necessary heat. This development might make H-bombs cheap, even if A-bombs were not.

Such achievements would facilitate the nuclearizing of small wars, the nuclear arming of allies, and the spread of nuclear power, but it seems unlikely that their effects will be significantly asymmetrical in their impact on the U.S.–U.S.S.R. power equation during the next decade. Unless one of the adversaries "goes underground" on a national scale, more destructive weapons than those now extant would appear of marginal value, although they could prove useful if coupled with inexpensive but relatively inaccurate missile systems and employed against superhardened missile sites, or possibly submarines. More plentiful nuclear weapons might facilitate the extensive use of anti-missile systems, but the present limitations on this form of air defense do not stem from the cost or scarcity of fissile materials.

As for the range of weapons delivery, it now seems possible to extend that of aircraft and missiles to global dimensions. For what it is worth, Mr. Khrushchev has already been quoted as having said that his rockets can hit a target 8,700 miles away. Our own Air Force Chief of Staff has mentioned the prospect of a third ballistic missile family, beyond the improved ICBM, which he dubbed the Global-Range Ballistic Missile (GRBM), "with a range of over 10,000 nautical miles—that is sufficient to reach any target from any launch point on earth." [52]

The advantage of such an ultra-long-range weapon would lie in its ability to outflank certain enemy attack warning radar systems, such as the northern BMEWS radar line being constructed by the United States, and to permit the global dispersal of missile sites. The protection afforded by such dispersion would appear to favor the United States, although the same ends may be more cheaply achieved with sea- and air-based missile "sites." [53]

The effort to increase the speed of manned aircraft continues at full tilt, with currently operational interceptors capable of exceeding 1,000 miles per hour and planes on the drawing board planned to achieve cruising speeds of 2,000 miles per hour and above.[54] Of these, the controversial U.S. F–108 fighter and B–70 bomber projects are examples. Such endeavors are deemed necessary to enable manned aircraft to continue to perform missions for which missiles are, and may long continue to be, unsatisfactory. These include intelligence acquisition

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[52] Gen. Thomas S. Power, "SAC and the Ballistic Missile," Air University Quarterly Review, vol. IX, No. 4, Winter 1957–58, p. 10.

[53] William M. Holaday, Special Assistant to the Secretary of Defense for Guided Missiles, told Congress last June that consideration was being given to the siting of missiles on islands over which the United States had control. Making a target of the continental United States, Holaday said, "is not the most desirable thing for us to do." The Air Force subsequently revealed plans to construct a missile base on Okinawa of an unannounced type.

[54] The accelerating rate of progress in military technology is illustrated by the fact that manned aircraft did not succeed in breaking the sound "barrier" in level flight until 1947, but attained speeds twice that of sound in 1953 and triple that of sound 3 years later.

and reconnaissance, long-range air target identification and strike missions requiring a very high order of accuracy in bomb delivery.

Of greater significance are foreseeable refinements in the ICBM itself, in addition to the range extensions mentioned previously. The long-range missile field, as Dr. Herbert F. York [55] and others have stressed, is still a new and relatively unexploited area of applied technology, perhaps comparable to the status of aircraft technology in World War I, and relatively great advances can therefore be expected in it. Among these are various methods of making ICBM's cheaper, more accurate and more reliable, shortening their reaction times, adapting them to mobile launch sites and, should it prove necessary, making them more difficult to detect and intercept in flight.

Foreseeable means of maintaining the penetration ability of ICBM's, should this prove necessary, include auxiliary engines or separable drag skirts to alter their trajectories in flight, application of radiation and anti-radar shielding to their warheads, multiple warheads, and the use of missile-borne chaff, decoys, and jammers to disrupt defensive radars.[56]

Evolutionary increases in the power of strategic missile warheads can be expected. The great importance of such improvements, and inevitable refinements in missile accuracy, lies in their effect on the number of attacking missiles needed to destroy a hardened enemy missile site, for on this missile-to-target ratio rests the practicality or impracticality of a surprise missile attack on the defender's retaliatory rockets. Estimates quoted earlier in this study [57] indicate that the number of attacking missiles requisite to the probable destruction of such a target can be reduced from 60 to 14 as the accuracy of a 2-megaton missile is refined from 3 to less than 2 miles. The deterrent utility of hardened U.S. missile sites can be said to vary inversely with Soviet progress in these parameters of missile performance. In this respect, the fact that the Soviets have a distinct edge on the United States in the size and power of missile engines, and a consequent ability to launch bigger payloads of guidance machinery or destructive power, is of small comfort.[58]

As has been earlier mentioned, the anticipated development of solid fuel ICBM's in the early 1960's, such as the U.S. Minuteman predicted for 1963–64, will greatly reduce the reaction time of these weapons and, by shrinking their size, facilitate their hardening or mobilizing. It has been said that such missiles will be kept in a constant state of checkout, with their guidance gyros running continually, and can therefore be launched in a matter of 1 or 2 minutes.[59] The optimum present countdown time for liquid fuel ICBM's is 15 minutes.

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[55] See the copyrighted interview with Dr. York, the Director of Defense Research and Engineering, published in U.S. News & World Report, vol. XLVII, No. 4, Sept. 7, 1959, pp. 76–79.

[56] These refinements, and the difficulties they would create for projected anti-missile missile defense systems, are discussed in unusual detail in a statement presented to Congress by the Advanced Research Projects Agency. See House Hearings on Fiscal Year 1960 Defense Budget, pt. 6, Apr. 15, 1959, pp. 93–99.

[57] See Murphy, op. cit., p. 248.

[58] Dr. York has credited the Soviets with a clear lead in missile propulsion but believes it possible the United States may be ahead in the guidance, accuracy, and reliability of its ICBM's.

[59] House Hearings on Fiscal Year 1960 Defense Budget, pt. 5, Apr. 9, 1959, Maj. Gen. Bernard A. Schriever, p. 280. General Schriever, Chief of the Air Force's Ballistic Missile Division, has described the launching of such a missile as "practically instantaneous."

Our own Air Force's concept of a third generation ICBM, according to one trade press commentary, stresses the desirability of extremely accurate guidance for counterforce missions, ability of the missile to maneuver defensively, and a reduction in weight and size to facilitate hardening or mobility.[60] An alternative course of development, should effective antimissile systems become feasible, is that of low-altitude, supersonic, cruise missiles powered not by rockets but by nuclear ramjets. Such missiles might penetrate below the coverage of defensive radar screens, a tactic now used by aircraft.

It would be a mistake to suppose that such progress within a weapons generation cannot have a decisive impact upon the strategic balance. It is always possible that one side may gain and keep such a lead in making such improvements that, in appropriate circumstances, it will hold an advantage of this magnitude. The American postwar development of strategic bombers is perhaps an example.

But it is the peculiar and perhaps unprecedented character of the nuclear-missile weapons generation, earlier posited, that suggests the unlikelihood of this happening during the next decade, assuming a roughly comparable research and productive effort in military technology on both sides of the Iron Curtain. For it will be seen that the advances in missile performance anticipated above primarily reinforce, rather than revolutionize, those strategic effects already felt. These stem from the missile's quick reaction time, its ability to be kept in a state of high alert, and the grave difficulties of providing warning, much less defense, against a weapon of such small size, potentially unlimited range, and extremely high velocity. It is true that improvements in missile accuracy favor the potential aggressor, and those in reducing the size and necessary support equipment of missiles the defender (enabling him to better harden or to mobilize his retaliatory forces), while increases in warhead power may be said to benefit both sides, but the anticipated progress in these areas does not yet appear sufficient in magnitude or effect to bring about a new weapons generation in the period under study. More likely is a continued eclipse of active defense on the one side (that of the potential victim of a surprise attack) and the increasing handicap of the uncertainty principle on the side of the aggresor, tending together to support a highly qualified form of strategic stability.

Let us now consider two additional weapons systems, Camal and Dynasoar, now under development by the Air Force. The former, a system of continuous airborne missile alert, envisages nuclear-powered aircraft on continuous patrol outside the periphery of Russian early warning nets; these aircraft would be capable of initial attack with ballistic missiles, followed by low-level, high-speed penetration of Soviet defenses to reach hardened targets with nuclear bombs.[61] The Dynasoar (for dynamic soaring) is described as an unpowered glider, boosted to near satellite speeds and altitudes by rocket engines from which it glides or skips around the earth on the fringes of the atmosphere. There is considerable disagreement about the missions suitable for such a vehicle, as both reconnaissance and attack missions have

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[60] James Baar, "AF Wants Extra Billions for Space," Missiles and Rockets, Aug. 17, 1959, p. 19 ff.

[61] See Maj. Gen. Donald J. Keirn, "A-Power for Aircraft," Ordnance, January–February 1959, pp. 568–570.

been mentioned in addition to research aimed at perfection of a maneuverable space weapon.[62]

Both concepts would seem admirably designed to extend the utility of manned aircraft, in time and into space respectively, by making them less vulnerable to air defense systems than the present strategic bombers. Camal, in particular, might ameliorate certain dangers of the early missile gap period if both aircraft nuclear power and air-launched ballistic missiles can be perfected in time. Both systems could have military utility in the mid-1960's and beyond, when ICBM's have become the dominant strategic weapons—Camal could provide an effective supplementary retaliatory system (partially protected from attack by the mobility of long-endurance aircraft) while Dynasoar could conceivably develop reconnaissance capabilities of value.

One may express skepticism regarding both possibilities; there are few current indications that Camal would be much less expensive than an equivalent missile force,[63] and Dynasoar seems a marginal competitor with the reconnaissance satellite as an intelligence collector, but the point to be made here is that neither system appears likely to have a decisive effect on the balance of power even if fully realized.

It is well to remember that these advanced strategic systems are in no sense of the word "ultimate weapons." The value of the present and near-future ICBM's, for example, is limited by their high cost, fixed trajectory, requirements for advance targeting data, and their inability to attack moving targets, to provide poststrike reconnaissance of their targets, or to be reliably recalled in flight.[64] There is also an obvious waste of fuel and effort involved in hurling a weapon the size of a lighthouse hundreds of miles into the sky to hit a target on the surface of the earth. These limitations may be overcome by the discussed ICBM improvements or other means, but their existence argues against confidence in a one-weapon strategy and any hopes that, in achieving the thermonuclear-armed ICBM, man has reached the pinnacle of his destructive powers.

The following section will examine the prospects of achieving a new weapons generation by advancements in defensive systems.

C. THE PROSPECTS OF A NEW WEAPONS GENERATION FROM ADVANCES IN DEFENSE

If new weapons generations of decisive strategic import do not appear likely to evolve from the continued advance of offensive weap-

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[62] J. S. Bluts, Jr., op. cit.

[63] Dr. Herbert F. York has testified that application of nuclear power to flight will not be accomplished "for less than $10 billion or some multiple thereof. That is going to be very expensive, if done." Military Construction Appropriations for 1960, hearings before the Subcommittee of the Committee on Appropriations, House of Representatives 86th Cong., 1st sess., "Overall Statements, Department of the Air Force," June 6, 1959, p. 769.

[64] The present inability to recall a launched missile is a limitation of the greatest importance. It means that missiles, unlike aircraft, cannot be protectively launched on the basis of partial, and perhaps mistaken, radar warning of an enemy attack, and must therefore be sufficiently hardened or mobilized to "ride out" the assault. SAC's commander has testified that his headquarters received several false radar attack warnings during the past year alone and, for this reason, "* * * cannot see for the foreseeable future how we can launch them [missiles] on the basis of radar detection alone. This is why their sites have to be hardened, and this is why they must be complemented with a manned bomber force that can get off the ground and insure survival." House Hearings on Fiscal Year 1960 Defense Budget, pt. 2, Feb. 13, 1959, Gen. Thomas S. Power, pp. 377–379. (Note: Fusing devices to "dud" a nuclear warhead, or to destroy its missile carrier in flight, do not solve this problem. Enemy radar screens may reflect the oncoming missiles before they can be destroyed, and the devices themselves present obvious problems of reliability.)

ons in range, speed, and destructive power, they may of course result from technological achievements reversing this course of development. A highly effective defense against aircraft and missile attack, for example, would give the side first possessing it the ability to threaten or to initiate war without fear of major retaliation. If both sides achieved such a defense more or less simultaneously, war and threats of war might be degraded to the weapons of the conventional and nuclear generations earlier described.

It is well to note here that a common misapprehension about the triumph of the offense over the defense in strategic warfare has marked our time. Despite the enthusiasm of airpower proponents, the eclipse of air defense did not result from overwhelming advances in aircraft performance. On the contrary, the defense had actually gained in its relative effectiveness against aircraft. During World War II it was rare indeed for the defender to impose a 10 percent attrition on attacking bombers, and the Battle of Britain was won by less than that. In contrast, during the early postwar years, when both bombers and interceptors became jet propelled, the probable attrition rate on raids was officially estimated at around one-third. More recently, with surface-to-air and air-to-air missiles added to the air defense team, estimates of their probable effectiveness hover around 50 percent. The major advance in air delivery meanwhile has been in its range, which has widened the geographic scale of strategic battle, permitting the United States and the Soviet Union to become direct strategic air opponents. What has made the difference, and placed the defensive almost hopelessly at a disadvantage, is the great destructive force of the payload bombers now can carry.

Thermonuclear weapons have made credible those theories of strategic air warfare advanced by the Italian Giulio Douhet almost a half century ago. Brigadier General Douhet argued forcefully, if prematurely, that a strategic air offensive could by itself decide the outcome of war between major powers, that the destructiveness of aerial bombardment places a premium on striking first at the opponent's air force, and that resources should not be diverted from offense capabilities to air defense. With the advent of the nuclear-tipped missile, against which there is as yet no defense (and uncertain prospects that there will ever be a defense of real significance), the offense's delivery means have at last forged ahead of the defense in strategic air warfare.

In theory at least, radical rehabilitation of the defense could cancel both the overwhelming increase in weapons destructiveness and the extended geographic scale of the strategic battle. It could thus reverse the present trend toward military shrinkage of the earth and the time compression of warfare, requiring vastly greater efforts to achieve military destruction, and restoring to the United States most of the advantages of its distance from the Eurasian land mass. The weapon to accomplish this might be, for example, an energy beam, generated by machinery so heavy and complex that it could only be employed from the earth's surface, which could repel, neutralize, or explode incoming aircraft and warheads. Such a beam would have to be able to penetrate any degree of shielding incorporable into strategic delivery vehicles and to intercept enemy warheads before their explosion could damage their intended targets. To fit this con-

cept, the beam could not be capable of operation at intercontinental ranges, because, if that were possible, it would then become a new weapon of strategic offense.

The example is a fanciful one for the foreseeable future, as it does not now appear possible to create either an anti-gravity screen or indeed any system providing 100 percent effectiveness against all the means by which nuclear weapons can be delivered on large targets.[65] It is hazardous, though, to say what is impossible over the farther horizons of technology.[66] Short of defensive improvement approaching this magnitude, however, the defense suffers from two serious handicaps which render it unlikely to reverse the course of weapons development.

The first great disadvantage of the defensive is that the offense possesses the initiative in technological development. A defense against weapons which neither exist nor are anticipated is meaningless, but an offensive weapon against which there is no defense is ideal. Consequently, inventive effort is directed at the development of offensive weapons against which no defense yet exists, while those concerned with defensive armament must usually wait until they know what it is they must defend against. For this reason, in any rapid evolution of weapons systems, the defensive weapons generally lag behind the offensive ones.

The second handicap of the defense is that the tactical initiative usually lies with the offensive. This is because the aggressor can choose the place, method and time of attack, the targets against which it will be concentrated and the way in which it will be conducted. To overcome this tactical handicap, the defense has to exploit fully the fact that it is the more firmly anchored to the earth's surface. Thus the defensive weapons can be concentrated around the most valuable installations of the defender, and can utilize systems which are heavier, more precise, and more elaborate than those which give the offense its flexibility and its tactical advantage.

It is not too difficult for a defense system to reduce the impact of the offensive by a modest fraction, but becomes increasingly costly as that fraction increases. The point is soon reached where it becomes more costly to increase the effectiveness of the defense by a stated fraction than it is for the offensive to increase its effectiveness enough to overcome the increased defense. In the familiar phraseology of economics, the marginal utility, measured in real costs, of the additional offensive effort, comes to exceed that of the defensive. That is one reason, though not the only one, why military men now say that the best defense is a good offense.[67]

These observations do not apply in all circumstances. They did not apply when the offensive weapon was, in World War I, a man with a rifle and the defensive a man with a machinegun. They did not apply in the few World War II air battles over Germany when

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[65] Wilcox, op. cit., pp. 81–82. The author also states (in contrast) that man now has the radioactive means "to kill every living thing on the earth at a level of biological organization higher than that of the insects and plants," p. 25.

[66] An anti-missile beam, based on the intense radiation of thermal energy, has been described as a possible byproduct of present research on photon missile engines. See Eugene Sanger, "The Photon Rocket and the Weapon Beam," The New Scientist, vol. 6, No. 147, Sept. 10, 1959, pp. 383–384.

[67] The maxim is particularly applicable to defense against nuclear weapons (provided the offense can be and is directed at enemy weapons and their delivery means) because the great destructive potential of individual nuclear bombs and shells calls for an impractically high effectiveness from active defense systems. For a discussion of this problem on the tactical level, see Col. T. C. Mataxis and Lt. Col. S. L. Goldberg, "Nuclear Tactics," Military Service Publishing Co., Harrisburg, Pa., 1958, ch 6.

the offensive weapon was a propeller-driven bomber and the defense a jet or rocket-powered interceptor; it is possible they will not apply when the offense employs jet aircraft and the defense highly sophisticated guided missiles. In these cases one weapons generation is being countered with another, with the defense generation the more advanced. The hypothetical energy beam mentioned earlier would be another example.

When the defense thus forges ahead of the offense by moving first into the next weapons generation, or by making a marked technological stride, the offense advantage in tactical initiative can usually be relied on to hold this lead to a minimum while military technologists use their initiative to solve or to bypass the problem. It is conceivable that the propeller bombers of World War II could have held their own against jet interceptors had they had unilateral possession of air-to-air rockets. (In practice, against the relatively weak threat of the new German interceptors, the bombers employed both mass and new tactics which enabled them to continue their operations, albeit with higher losses.)

For reasons such as these it is difficult to believe that there is a substantial chance of a new weapons generation emerging from development of defensive systems that could, in effect, nullify or reverse progress in the destructiveness of strategic weapons and the speed and range of their delivery vehicles. Certainly the Nike-Zeus antimissile missile system, the only such active missile defense system known to be under development in this country, does not offer such a hope. Its potential appears limited at best to the spot defense of a relatively few vital targets from a relatively primitive missile attack.[68]

Yet the desperate effort to find a defensive counter to actual and even potential offensive threats can and must go on. Disastrous consequences could accrue to the side whose opponent first produced a highly effective aircraft and missile defense. It is always possible that generation-jumping advances may set back the offense temporarily, but to find that combination of capabilities and potential that constitutes a new weapons generation we shall have to look elsewhere.

D. PROSPECTS OF A NEW WEAPONS GENERATION FROM CBR [69]

The military utility of chemical and biological weapons is a subject about which much has recently been written, but little has actually been said. Numerous official and officially inspired accounts have attested to the potential effectiveness of these agents in the most general terms, but skipped lightly over the methods and probable results of their actual employment in war.

Such selectivity cannot be solely attributed to the requirements of military security, or to the atmosphere of moral opprobrium which

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[68] Nike-Zeus, a missile defense system under development by the Army, is a descendant of the Nike family of ground-to-air missiles and relies upon the same general concepts of active terminal defense. Considerable professional skepticism has been expressed about the effectiveness of such a "conventional" system against swarms of incoming warheads that approach their targets at 250-miles-per-minute speeds and are accompanied by foreseeable devices to confuse and disrupt defense radars. See the appraisal of Nike-Zeus by the Advanced Research Projects Agency in House Hearings on Fiscal Year 1960 Defense Budget, pt. 6, Apr. 15, 1959, pp. 94–97. Compare Eric Burgess, "The Anti-Missile Missile—A Myth?", Interavia, vol. XIV, No. 2, 1959, pp. 170–172.

[69] Chemical, biological, and radiological warfare, sometimes referred to as ABC or toxicological warfare. For a current survey of CBR, see "Research in CBR," Report of the Committee on Science and Astronautics, U.S. House of Representatives, 86th Cong., 1st sess., Aug. 10, 1959.

surrounds CBR. Much of it stems instead from a variance between the theoretical or laboratory deadliness of these weapons and the practical limitations on their field use.

In the field of biological warfare (the intentional use of microorganisms or their toxic products for attack on men, animals, and crops), considerable progress has apparently been made in exploiting and intensifying the virulence of nature's disease agents. Up to 45 such agents of varying military utility have been mentioned. But BW, by its very nature, is limited by the incubation period of infectious diseases and must therefore be considered primarily a strategic weapon for use against civilian targets.[70] In this role, the dissemination and effectiveness of BW agents is dependent on meteorological conditions in the target area. Bright sunlight, for example, is rapidly destructive of living microorganisms.[71] It has been estimated, however, that a surprise BW attack on an enemy city "might in time cause numbers of casualties approaching those of a small atomic bomb." [72]

The use of BW weapons by saboteurs in advance of a nuclear attack has been frequently suggested. The more obvious obstacle to such a campaign, as with any widespread pre-attack sabotage, is that capture of a single enemy agent might "give the show away" and invite nuclear retaliation.

Greater strides have been made and promised in the development of a wide variety of chemical agents, varying in their effects from almost instant lethality to temporary mental or physical incapacitation. Refinements of the World War II German nerve gases are now said to kill in less than a minute and to be very difficult to defend against.

The newer incapacitating agents, sometimes referred to as psychochemicals or hallucinating agents, appear promising in concept as a means of gaining military control over limited areas without the wholesale destruction of life and property associated with the use of conventional or nuclear explosives. Their stage of development has been greatly exaggerated in the press, however, and even the most optimistic military sources speak of their operational employment as at least 3 to 5 years away. It must be added that the characteristics of chemical weapons, including their sensitivity to weather conditions, generally limit them to tactical or battlefield use.

The military utility of BW and CW weapons is further restricted by the inadequacy of present delivery techniques. Those methods discussed in both the press and Chemical Corps releases are essentially those available, but left fallow, in World War II—aerosols, aircraft bombs and sprays, field generators, mines, shells, and rockets. Unclassified information on Soviet techniques, and the more imaginative Communist works on this subject themselves, are equally barren.[73]

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[70] LeRoy D. Fothergill, M.D., "Biological Warfare and Its Defense," Armed Forces Chemical Journal, September–October 1958, p. 4.

[71] Ibid., p. 5.

[72] Statement of the Pugwash International Conference of Scientists on Biological and Chemical Warfare, Aug. 30, 1959, p. 3.

[73] See, for example, "Bacterial Warfare," a special issue of the Chinese Medical Journal, Nos. 9–12, September–December 1952, and Supplement. The bulk of this issue is devoted to propaganda charges against the United States, but several appendixes discuss BW methods of disease transmission in detail.

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It is true that a similar lag between the development of weapons and that of their delivery vehicles has restricted the military utility of conventional and nuclear explosives. The disparity has been largely overcome in these areas, and there is no reason to believe that similar progress is impossible in CBR. A means of rapidly inundating large areas with psychochemical agents could have a significant impact on strategy, particularly on American attitudes toward the "immorality" of CBR weapons and, possibly, on our reluctance to strike first.

At the moment, however, it is difficult even to imagine such a device; its attainment seems highly unlikely on the basis of the available literature on CBR. Development in this area can be expected to continue at the present relatively low levels on both sides of the Iron Curtain, if only as a counter to possible agents and delivery means which the adversary may produce. CBR does not promise a new weapons generation as that term is used here. Chemical and biological weapons may instead best be considered as specialized military tools, an ancillary civil and military defense problem, and a type of armament theoretically available to relatively unindustrialized nations.

E. PROSPECTS OF A SATELLITE WEAPONS GENERATION

Having reviewed and rejected both radically improved defense systems and the chemist's and biologist's laboratories as probable sources of a strategically decisive new weapons generation, we now come to what, with considerable hesitation, may be presented as a possibility. Its crux is the military employment of earth satellites, which promise to become available in considerable numbers and with a relatively high degree of sophistication within the next decade.

There is one obvious reason for considering whether these vehicles may alter the military balance. It has been suggested that the present nuclear-missile generation may, in a later stage, be conducive to a qualified form of strategic stability when the strategic weapons of both adversaries are predominantly composed of missile systems that are relatively secure from attack. But let us suppose for the moment that the majority of U.S. retaliatory missile installations become known to the Soviet Union, while only a few of theirs are known to us. Let us presume further that the anticipated mobile missile systems, such as the submarine-mounted Polaris and railway-borne Minuteman, turn out to be less secure from attack than is now hoped to an enemy who has access to the quality and quantity of military intelligence available in our free society.[14] In these circumstances it would be extremely difficult for the United States to develop a relatively secure strategic force. But a really effective surveillance and communication satellite network might offset the Soviet intelligence advantage in this respect, with consequences so profound as to credit the satellites with introducing a new weapons generation.

The possibility seems real, the probability not high. A relevant contrast here is that between the information available to the Soviets

[14] The location of these weapons would not have to be "pinpointed" prior to attack, as rail-mounted weapons could not be effectively hardened against blast pressure, and water transmits the shock waves of nuclear explosions over considerable distances. Given the same vulnerability to detection that now characterizes aircraft, submarines could be destroyed with comparable effectiveness. See the discussion of this problem in Gen. Pierre M. Gallois "Mobility in Global War," Interavia, vol. XIV, No. 3, 1959.

by firsthand ground observation and by reading our publications, and the information obtainable by electronic, optical, and infrared reconnaissance systems from positions 100 or more miles above the Soviet Union (coupled with additional information from listening posts on its periphery).

Wartime aerial reconnaissance built up a remarkable record of accomplishment, but the technical obstacles to space reconnaissance appear multiple and restrictive. They include such problems as the penetration of cloud cover, camouflage, and darkness, as well as the technical difficulties and delays stemming from the elaborate chain of events by which images are received, recorded, transferred to a storage device, relayed to the earth's surface, reproduced, and examined.

The most optimistic published description of satellite reconnaissance potential credits such systems with the optical identification of objects from 75 to 100 feet in size from an assumed altitude of 150 miles.[75] This is said to permit detection of missile launch pads under favorable conditions, yield the location and gross characteristics of all major airfields, facilitate the tracing of communication lines and detect large moving ships at sea by their wakes. The same source notes, however, that even high-altitude aircraft photography, credited with identification of objects 5 to 10 feet in size, would have difficulty identifying a well-camouflaged underground missile base. Short-range and cruise missile systems would be even more difficult to identify because they are easier to hide.

Achievement of even a crude reconnaissance satellite system by the United States might well induce the Soviets to devote greater efforts to the burial and camouflage of missile systems and other key installations than might otherwise be necessary. This would indeed be a bonus effect, but one whose cost to the Soviets would hardly compensate alone for the cost of establishing the system. There also remains a serious question of whether the United States can put such a system into operation in time to detect the more obvious, above-ground, construction of these bases in the early 1960's.[76]

Other satellite missions for the acquisition of information have been suggested. A principal one is the Midas system which envisages the detection of missile firings by satellites equipped with infrared sensors. The utility of such a device would appear marginal in comparison with the Navy's Project Tepee intercontinental radar system, and other means of detecting missiles early in flight, but an infrared system might prove less prone to spoofing or jamming than radars and should, at the very least, provide some verification of attack warnings

[75] This level of performance was stated to be within present optical capabilities in a paper submitted by the Western experts to last winter's Surprise Attack Conference at Geneva. See annex 6 of the Conference report, "Report of the Conference of Experts for the Study of Possible Measures Which Might Be Helpful in Preventing Surprise Attack and for the Preparation of a Report Thereon to Governments," United Nations, General Assembly, A/4078, Jan. 5, 1959.

A more recent prediction, by a specialist in aerial reconnaissance, is that satellites will be able to photograph objects as small as 7 feet in dimension by 1962 and, in the period 1965–70, may be able to photograph at night objects as small as 2 feet from an altitude of 300 miles. The predictions are those of A. A. Koeppfer, Chief of the Photographic Reconnaissance Branch of the Wright Air Development Center, Dayton, Ohio, as quoted in John W. Finney, "Expert Envisions U.S. Space Camera," the New York Times, Oct. 2, 1959, p. 8.

[76] A U.S. program for development of a reconnaissance satellite and associated equipment is now being supported at the funding level of $100 million annually, an indication of its importance. Published estimates of its operational availability fall in the 1962–64 period.

obtained from other sources. It should be said, however, that there appears to be little hope of the Midas system, or other satellite-borne missile detectors, becoming operational in time to relieve our strategic bombers of their imminent vulnerability to missile attack.

Probable satellite missions within the next decade include the facilitation (or intentional frustration) of long-range communications, mapping, space photography, navigation, and meteorological reporting.[77]

The exploitation of satellites for these missions will be of relative advantage to the United States, with its needs for intelligence of the Soviet Union, and for communications between globally dispersed land, sea, and air forces. The support and efficient utilization of satellite vehicles will, however, require extensive and expensive tracking and data acquisition facilities in addition to the specialized equipment needed for the support of space probes, manned space flight, and the detection of enemy satellites.[78]

Such satellite systems will no doubt be of considerable military and scientific value, but there are no strong indications in unclassified descriptions of their potential, or in the level of funds now allocated to their development, that their strategic value would be of sufficient magnitude to qualify as a new weapons generation in the sense that term is here employed. Bombing from satellites, which is so frequently suggested, appears feasible but of great difficulty and marginal value in comparison with existing and anticipated land-, sea-, and air-based missile systems; unmanned satellite bombers might have eventual utility as a supplementary deterrent system, but they would have to possess almost unprecedented qualities of mechanical reliability.

These judgments must be immediately qualified by saying that it will be at least a decade before the implications and possibilities of the nuclear-missile weapons generation itself (much less the military potential of space vehicles) are fully apparent, and it will be known with greater assurance whether the anticipated missile systems can be made sufficiently secure from attack to bring a measure of qualified stability to the strategic balance.

In the absence of other possibilities, however, it will be instructive to examine briefly the circumstances in which there might appear a new generation of strategic weapons systems, based upon satellites, even though long-range missiles themselves remained the dominant weapons.

There are two means by which such a change could come about. First, the introduction of satellite links into the surveillance and communications elements of the weapons systems must so enhance the effectiveness of the systems that the side which first introduces them

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[77] The potential of satellites for these missions is discussed in "Space Handbook," op. cit., and the latest budget statement of the Advanced Research Projects Agency. See House Hearings on Fiscal Year 1960 Defense Budget, pt. 6, Apr. 15, 1959, pp. 91–103.

[78] The initial exploration of space has already multiplied, rather than subtracted from, the needs of the United States for overseas installations. This Nation now utilizes space-tracking and data-acquisition facilities located in such diverse areas as Alaska, Argentina, Australia, Chile, Ecuador, Germany, Hawaii, Iran, Japan, Nigeria, Peru, South Africa, and Spain. These are in addition to an impressive variety of domestic installations, including an electronic "fence" for the detection of "dark" (nonradiating) enemy satellites that spans the United States from California to Georgia. Considerable expansion of these facilities is believed necessary if the United States is to obtain full benefit from operational satellite networks.

gains a significant advantage. Second, the weapons systems must become so dependent upon satellite links that the comparative utility of rival missile systems would turn upon their use of satellites. In this situation progress in satellite technology would assume a very high priority, and the satellites themselves might well become the primary targets of defensive action.

The phenomenon of growing dependence upon elements in a weapons system that were originally peripheral is familiar enough. (Try to imagine the performance capabilities of modern submarines or tank forces, for example, without radio communications.) As for intelligence itself, students of the subject have repeatedly remarked on the dependence of "small" or tactical nuclear weapons upon the "acquisition" (intelligence) of targets against which they may most suitably be employed. The possibility exists that satellites may become essential components, not only of military weapons systems, but also of many nonmilitary activities. World telephone communications, world television, worldwide systems of weather prediction, and all manner of projects of space exploration and exploitation of interest to many nations may come to depend for their effectiveness upon satellite systems. In these circumstances, satellites would become as familiar, and as taken for granted, as radio communications today. All we are supposing beyond this general hypothesis is that strategic weapons systems will be included in the category of systems that may develop this satellite dependence.

Even so, the introduction of satellite links would not produce a new weapons generation unless the criteria earlier laid down for the transition from one weapons generation to the next were satisfied. Either the military importance of satellites must afford the great powers a new starting point from which one of them might achieve a significant military advantage, or the capabilities that satellites lend the weapons systems to which they are linked must result in some basic alteration of the strategic confrontation. It has been suggested that the addition of satellite target reconnaissance to nuclear-missile systems might have the latter effect. But if the intelligence asymmetry between the United States and the Soviet Union should cease to be significant prior to the advent of satellite dependence, owing to the achievement of relative security of the strategic attack systems on both sides through their multiplication and dispersal, then a new generation would come about through satellites only in case they significantly degraded this security on one or both sides.

The most likely (though unfortunately by no means certain) development seems to be the delayed achievement by both the United States and the Soviet Union of a relative degree of security for their strategic attack systems, with the result that the strategic equation would eventually become more stable after passing through a period of agonizing and highly dangerous instability. Nevertheless, if a halt is not called to the arms race, there is always the danger that in time even the qualified stability here anticipated will be overturned by the further development of military and quasi-military technology. To present one of the possibilities in this regard, and to explore the nature of weapon advances beyond the nuclear-missile generation, the prospect of a satellite weapons generation has been invoked.

F. MORE REMOTE PROSPECTS

Some experts believe that, at least for the immediate future, it will remain easier to put a satellite into orbit than to distinguish it from decoys and then disable it with weapons fired from aircraft or the earth's surface. If their predictions are realized, satellite surveillance and communication links in the weapons systems now developing would be relatively secure from attack.

This measure of security would not long survive, however, once either side has achieved a maneuverable space vehicle or other means enabling it to selectively eliminate the satellites of its adversary while continuing to benefit from its own. Should both adversaries develop such instruments more or less simultaneously,[79] their terrestrial attack systems keyed to satellite links would become vulnerable to disruption. In these circumstances the ability to destroy an adversary's satellites might become the immediate objective of great national effort, much as the enemy's blockade capability became the objective of naval warfare between Britain and France in battles fought at the mouth of the Nile and the Bay of Biscay.

These and other more fanciful means of directing man's destructiveness away from the earth into space, and even onto the moon and the planets, lie far beyond the scope of this study. A consensus of even the more optimistic predictions on space exploitation places achievement of maneuverable space vehicles in the mid-1960's, and that of a manned offensive-defensive spacecraft 2 to 3 years later; the more pessimistic seers place the same developments in the 1970's.[80]

Further in the future appear such achievements as that of effective climate control, which the late John von Neumann prophesied with some justice may make all our present difficulties seem simple. Such a technique, it has been said with authority, might allow one adversary to put great and effective pressure on another without invasion of the opponent's territory by men or weapons.[81]

To mention these examples is to remind ourselves that the course of technological development does not lend itself to long periods of military stability, or to accurate prediction. Looking back upon the experience of recent years, one may detect a pattern in the prediction and realization of major technological advances. It is that the time required to achieve specific objectives of military research and development is commonly underestimated by the experts responsible for them, while the total impact of advance on a broader front generally exceeds immediate expectations and comprehension.

One reason for this is that the experts, and those who speak for them, tend to make exaggerated claims when they are engaged com-

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[79] An optimistic assumption in view of the pronounced Soviet lead in rocket power and the consequent ability to launch heavy payloads into space.

[80] See the compilation of space predictions contained in "The Next 10 Years in Space: 1959–69," staff report of the Select Committee on Astronautics and Space Exploration, House of Representatives, 86th Cong., 1st sess., January 1959.

[81] The recently announced effects of high-altitude nuclear explosions, in altering ionosphere characteristics sufficiently to disrupt radio communications over wide areas, may be considered a form of weather control in this regard.

It has been predicted that international control of weather modification techniques will become as necessary to the safety of the world as control of nuclear energy. See Henry G. Houghton, "Other Aspects of Weather Modification," in "Final Report of the Advisory Committee on Weather Control," transmitted to the President Dec. 31, 1957, vol. II, pp. 286–288. The possibility that Soviet attempts to modify the Siberian climate might drastically affect the rainfall available to the United States, Japan, and other nations is raised in Howard T. Orville (as told to J. A. Morris), "Stand By for Climate Control," the Saturday Evening Post, Nov. 29, 1958.

petitively in justifying charges against the military budget, while, at the same time, they take major advances in basic science for granted. The public, however bemused by promises of near-miracles in the early future, is slow to realize what is happening to technology until besieged by its products. How many Americans, for example, appreciate the extent to which our telephone communications now employ radio links (and for this reason may be vulnerable to interruption by nuclear weapons fired in space)? [82]

We are all familiar with the idea that one day TV receiving units will hang on the walls like framed pictures, and "transistorized" portable radios are already a commonplace. Yet it is a safe wager that we shall all one day be surprised to learn to what extent our electric gadgets have become dependent upon the products of research in solid state physics, of which these things are examples. Thus, if we are skeptical of our skills to forecast the future, it is not only because we are disposed to discount the claims of the experts, but also because of the lesson of experience that the broad impact of technological progress can be fully appreciated only after the fact.

With this qualification in mind, we shall now turn briefly to the earth, the present, and to developmental trends in tactical weapons affecting the localized application of military force.

G. TECHNOLOGICAL PROSPECTS IN TACTICAL WARFARE

In a study focused on the prospects and problems of strategic weapons and strategy, the development of those whose reach and destructive potential is tactical in scope must take a secondary place. Such relegation is warranted by the overriding influence of strategic armaments on the probability of total war. It is also true that no single development in tactical arms promises to make possible an abrupt shift in the existing distribution of military power.

It must be realized, however, that an anticipated result of strategic weapon developments within the next decade is that of making the initiation of total nuclear war increasingly hazardous for an aggressor [83] and the threat of initiating it decreasingly credible on the part of a deterrer. Under these conditions, the employment of localized military force for achievement of national objectives will become increasingly attractive, and therefore important to both adversaries. The discussion of tactical weapon trends that follows will be of necessity brief, but is intended to illustrate the scale of probable developments and their potential.

A broad range of evolutionary developments in tactical armaments have appeared on the technological horizon, the majority of them suitable to the application of force in nuclear or nonnuclear warfare.

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[82] The vulnerability of our communications systems to far simpler means of disruption has been recently demonstrated. See "Thousands Miss Series on TV as Engineer Sabotages Tower," the New York Times, Oct. 6, 1959, p. 47. The article states that placing of "a small metal object" in a remotely located microwave relay tower prevented television reception over a wide area of Michigan for 4 days.

[83] This is predicated, of course, on the important assumption that the potential of anticipated strategic weapons systems is fully exploited by the deterrer in their development, production, and appropriate deployment.

No attempt will be made here to survey the field; such surveys are available in authoritative detail elsewhere.[84] The new developments might be summarized, however, as making probable a continued reduction in the size and weight, and continued increase in the firepower and mobility, of weapons systems from the armed infantryman to the most powerful of tactical missiles.

There is a distinct trend, for example, toward increasing the destructive power available to lower levels of military establishments and even to individual soldiers. New "conventional" weapons illustrating and facilitating this trend are the recently developed U.S. 90-millimeter recoilless rifle suitable to one- to two-man use, one-shot, lightweight flamethrowers, small arms of greater magazine capacity and effective rates of fire, and field air defense weapons such as the Red Eye (a bazooka-launched, homing missile for use against low-flying aircraft).

This trend has been greatly accelerated by a continuous shrinkage in the size and weight of nuclear ammunition. The atomic artillery of 8 years ago was restricted to a mammoth 86-ton gun whose 280-millimeter bore reflected the contemporary size of nuclear shells. It was soon followed by an 8-inch howitzer of atomic capability, whose 15-ton gross weight made possible its transportation by air. The development of jeep-mounted nuclear projectors, and a one-tenth kiloton bazooka-type atomic weapon, have been recently reported in the press.

A similar shrinkage in size and weight, also favoring concealment, mobility and the availability of greater firepower to smaller units, has marked development of tactical missiles. U.S. Army tactical missiles are now entering their second generation with the 45-foot long, 6-ton Corporal field artillery missile, for example, being replaced by the 30-foot, 4.5-ton Sergeant with improved guidance and a self-propelled launcher. A sharper, though less direct, comparison can be made in the field of free flight (unguided) artillery rockets, where the 3-ton, 27-foot-long Honest John of the early 1950's is being supplemented by a one-half-ton, 12-foot Little John rocket that is said to be transportable by helicopter. All four of these weapons can be employed with nuclear or conventionally explosive warheads.

Evolutionary improvements facilitating greater ground mobility in warfare are illustrated by the use of aluminum armor, which reduces the weight of a personnel carrier from 20 to 10 tons (thus increasing its operational range from 120 to 200 miles) and the development (in Germany) of multifuel tank and truck engines said to promise reductions in fuel consumption of up to 40 percent.

Further in the future, and far greater in its impact on tactical mobility, lies the development of flying jeeps, trucks, and tanks to free tactical forces from the obstacles of terrain and dependence on prepared facilities such as airfields, rail lines, roads, and ports. A variety of such machines are now under development in the United States,

[84] For a survey of recent progress and developmental trends in a broad range of United States and Soviet Army equipment, see Marvin L. Worley, Jr., "New Developments in Army Weapons, Tactics, Organization, and Equipment," The Stackpole Co., Harrisburg, Pa., 1959. Mataxis and Goldberg, op. cit., discuss the utilization and importance of firepower and mobility on imagined nuclear battlefields. For an imaginative if sometimes fanciful look at tactical warfare of the future, see Lt. Col. Robert B. Riggs, "War-1974," Stackpole, 1958. A number of Riggs' predictions, such as the use of missiles for transport of small but vital supplies, are now being realized.

but their present status has been greatly exaggerated in the press; military estimates are that their practical operation lies in a 1965–70 time frame, and serious problems of fuel consumption and supply, requisite operative skill, and vulnerability to ground-to-air missiles of the homing Red Eye type remain to be solved.[85] Similar problems, and potentials, exist in the field of tactical aircraft with vertical take-off and landing (VTOL) characteristics on which the three services have spent some $80 million in development funds over the past decade.

These illustrative developments may be considered as merely evolutionary, but the rate of this evolution, as with the progress of military technology on the strategic level, is proceeding at an accelerating pace. To assess their importance for the type of localized warfare that this country has faced, and will undoubtedly continue to face, let us mention two brief examples of how evolutionary development in tactical weapons can be of great value if properly exploited.

The first is predicated on the continued refinement of relatively small and portable antitank missiles, such as the French SS–10 and SS–11, in relation to the 23 armored divisions with which the Soviet Army is credited. The tank is an impressive weapon compared to the individual infantryman, but is fortunately not as concealable. One-man weapons, utilizing bazooka-launched homing missiles, have now been developed for use against aircraft, and it is quite possible that similar devices could be designed for use against tanks. Such weapons, if sufficiently low in size, weight, and cost to be widely distributed, could radically degrade the Soviet armored threat to Western Europe, overcoming the tank as the English longbow "weapons system" made obsolete the armored knight in the 14th century.

The second example concerns the ability to move and fight effectively under environmental conditions in which the enemy cannot. Examples might be a superior ability to operate militarily in Arctic areas,[86] to maneuver and fire at night through the widespread exploitation of radar, infrared, and light-gathering devices,[87] and—with flying tactical vehicles—to move swiftly over terrain that hinders or obstructs the enemy.

Such opportunities lend themselves to exploitation by a nation of relatively advanced technology, but limited manpower, in comparison (or in conflict) with one whose strengths and weaknesses resemble those of our enemies in the Korean war. The desirability of exploiting them in these circumstances is apparent, as is the necessity of doing so in conflicts with opponents of both advanced technology and a numerical superiority in manpower.

It must be added, however, that a common fallacy in the assessment of tactical as well as strategic weaponry is that of concentrating on the theoretical military potential of a new weapon and ignoring the

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[85] For a detailed survey of present developments and military potentials in this field, see "The Ground-Cushion Phenomenon, Hearings before the Committee on Science and Astronautics," House of Representatives, 86th Cong., 1st sess., Apr. 13, 14, and 15, 1959.

[86] An impressive number of the inventions requested by the Services relate to the problems of mobility and survival in Arctic regions. See the pamphlet "Inventions Wanted by the Armed Forces" (National Inventors Council), U.S. Department of Commerce, May 1959.

[87] Rigg, op. cit., p. 244, predicts that "the first army that is able to adapt itself completely to the environment of darkness will possess such operational superiority as to enable it to defeat over twelve times its number under almost any circumstances."

The U.S. Corps of Engineers is now experimenting with various means of gathering, amplifying, and focusing reflected starlight for night combat. See Worley, op. cit., p. 248.

quantities of it that may be necessary to support a given strategy. In this regard it has been frequently and authoritatively stated by Gen. Maxwell D. Taylor and others that the United States has neglected to provide the quantities of even the most elemental of weapons systems, the individual soldier, required for the support of its defensive strategy, much less the quantity and quality of more sophisticated systems requisite to his support. For much of the past decade there has been a continued erosion of those non-strategic military forces called for by both the scope of national defense commitments and the strengths of our adversaries.

H. IMPLICATIONS OF THE NEW TECHNOLOGY

The development trends and anticipated weapons systems outlined in the preceding portions of this chapter may now be summarized and reviewed in terms of their more important military and political implications. For purposes of simplification this discussion will begin with mention of those significant weapon developments that do *not* appear likely within the next decade.

It does not now appear possible, for example, to develop active defense systems capable of protecting large areas from attack by the wide variety of delivery vehicles that loom on the technological horizon. A high degree of national security from nuclear attack is therefore likely to remain an objective unobtainable by military means during the next decade. The degree of security that is obtainable by military means will continue to depend on the ability to deter an enemy from using his strategic weapons, or the ability to destroy them before they can be used.

Nor does it appear possible to provide point targets whose location is known to the enemy with "invulnerability" to direct or even near-direct hits by multimegaton weapons. The protection of retaliatory power must continue to rely heavily on the dispersal, multiplication, and "mobilization" of strategic weapons systems.

Finally, it does not appear probable that substantial economies can be achieved in the individual or the collective costs of the anticipated strategic weapons systems. The trend here is quite the reverse, with each new generation of weapons costing at least twice as much as its predecessor.[88] A relevant comparison is that between the $7 million B–47 (Stratojet) bomber of the early 1950's and its successor, the $15 million B–58 (Hustler) of last year. While there has been considerable optimistic discussion of the second generation (solid fuel) ICBM's permitting purchase of "a missile in a hole" for $1–2 million (as opposed to an estimated $10 million for current ICBM's) such optimism ignores the probability that large numbers of these weapons will have to be deployed in compensation for their own limited destructive power and the accuracy of opposing enemy missiles.[89]

From these extremes of predictive optimism and pessimism we will now turn to those developments in military technology that appear highly likely in the 10 years ahead.

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[88] This ratio has been described by Assistant Secretary of Defense Wilfred J. McNeil as "a rough rule of thumb" for estimating weapon costs. See the copyrighted interview "Are Big Arms Cuts Really Coming?" U.S. News & World Report, vol. XLVII, No. 14, Oct. 5, 1959, p. 67.

[89] Published estimates of what the Air Force considers to be a desirable force level of Minuteman solid fuel ICBM's range from 800 to 2,600 missiles.

The first and most obvious probability is that military technology will continue to progress at a high and perhaps an accelerating rate, thus increasing both the performance of weapons systems and the number of systems that it becomes feasible to develop. Examples of the latter are the variety of projects now beginning to appear feasible in the area of space exploitation and the growing number of means for the delivery of nuclear explosives on strategic targets within an enemy nation. Such delivery is no longer restricted to aircraft bombers, but must now be considered possible with weapons fired from land, sea, undersea, space and clandestinely pre-positioned "platforms." The performance and sophistication of these delivery vehicles is furthermore of such magnitude that, barring the most unlikely development of a universal antimissile system, they can only be countered by systems of comparable complexity and specialization.

These trends may indeed be obvious, but their implications are of the greatest importance. Both the number and the cost of feasible weapons systems, for example, emphasize the need for choosing those most suitable to a nation's strategy for priority development—yet the destructive power of the new weapons, coupled to the fact that specialized means are required to counter them, emphasizes the risks of selection. These difficulties are intensified by the psychological side effects of the newer systems. What priority, for example, should be assigned to development of a manned earth satellite whose military utility appears negligible, but whose propaganda value and research contributions to the later military exploitation of space might be considerable? The guidelines for decisions of this nature can come only from a clearly formulated national strategy.

The course of technological development here anticipated appears to favor that nation whose purpose it is to deter a nuclear attack on both itself and its allies. Active defenses against the newer strategic weapons do not appear promising, but the very variety of feasible strategic systems should permit the deterrer to disperse such a number and diversity of retaliatory weapons that an aggressor could not have high confidence in his ability to locate and destroy a majority of them in a surprise attack. The situation is analogous to an animal trainer's parrying of a lion with the four legs of a chair. While the chair is a most unsuitable instrument for attacking a lion, its mobility and multiple striking edges suit it to a deterrent mission.[20]

It is indeed a thesis of this study that anticipated developments in strategic weaponry will, if fully exploited by the United States, make nuclear attack on this country or its allies increasingly hazardous for an aggressor and correspondingly unattractive to him as a rational course of action. However, this is at best a trend and one which will be undoubtedly accompanied by the continued refinement of those weapons that have made such an attack technically possible. As Quincy Wright has pointed out, the influence of weapons on the probability of war has been a fluctuating one and the history of the art of war has been "dominated by the effort of the strategists to

[20] The principle applies to other conflict situations (see Lt. Col. Rex Applegate (USA, ret.), "Kill or Get Killed," Military Service Publishing Co., Harrisburg, Pa., 1956, p. 94), but in this example it should be emphasized that the trainer has in reserve more suitable weapons for attacking a lion.

devise new weapons, new maneuvers, and new organizations with which to win a rapid victory." [91]

Certainly the individual and cumulative effect of recent developments in strategic weapon delivery, coupled with the continued production of nuclear explosives by both major adversaries, has been to raise the level of the strategic confrontation to ever higher plateaus of destructive capability. As a result, provocations that might once have been considered sufficient to justify the initiation of total war cannot now be rationally so construed.

But to believe that this high level of strategic confrontation has made total nuclear war irrational, and therefore impossible, would be to ignore those counterfactors tending toward instability in the nuclear equation. These tendencies toward instability are discussed in the succeeding chapter. Unless they can be satisfactorily dealt with, all-out nuclear attack must be considered a continuing possibility. One conclusion to be drawn from this is that the potential victim of such an attack must maintain an ability to fight back in a rational manner. A further implication is that to neglect those civil defense measures requisite to the achievable protection and recovery of a nation's population from attack is to take substantial risks.[92]

A second area of implications stemming from the anticipated course of development in military technology concerns its relationship to the distribution of modern military power. For it is apparent that the cost and complexity of the new strategic weapons systems preclude all nations except the United States and the Soviet Union from attaining the military status of major powers, or even from participating in the strategic arms race on more than the narrowest of fronts.

It may well be true that "nearly all of the world's nations have scientists who can eventually succeed in designing and making their own atom bombs," [93] and that a handful of technologically advanced nations may succeed in creating and maintaining one or two modern weapons systems.[94] But only the United States and the Soviet Union can proceed with that variety of highly specialized and expensive weapons projects requisite to the maintenance of strategic military power in an age of rapid technological development and obsolescence. And even between these two great powers, one or the other must be granted the ability to achieve significant technological leads in given areas of priority.

This is not to say that Allied contributions to arms development are or will be of negligible value. They can become increasingly important in specialized and limited areas of weaponry, as indicated by

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[91] See his "A Study of War," the University of Chicago Press, Chicago, 1951, p. 792, ff. Wright states that the increasing costs of war have tended to reduce its utility as an instrument of policy and to heighten the reluctance of nations to resort to it. This same tendency, however, has increased the political utility of war threats and war potential. See the above, pp. 320–321.

[92] Various studies have indicated that the casualties suffered from a nuclear attack might be considerably reduced by a nation willing to take extensive civil defense measures. See, for example, the Rand Corp. study directed by Herman Kahn, "Report on a Study of Nonmilitary Defense," Report R–322–RC, July 1, 1958. The report states that a completely effective enemy missile attack on 150 U.S. cities might cause 160 million deaths among an unprotected population, but that a comprehensive system of blast and fallout shelters might hold casualties to 25 million if there were 30 to 60 minutes' warning of the attack. For these and other estimates of U.S. casualties under various attack and defense conditions, see the report, ch. II, pp. 5–13.

[93] Wilcox, op. cit., p. 81.

[94] The British V-bomber force and the French efforts to develop a nuclear bomb and appropriate delivery vehicles are examples.

the recent British and French development of promising antitank missiles and the successful Belgian development of a modern infantry rifle. But it is also probable that the broad issues concerning the production and utilization of strategic weaponry will remain primarily bipolar in scope. As the bilateral development of missiles both endangered U.S. overseas airbases and made them less necessary, so the missile gap has become a question of collective importance but one that can only be answered by the United States.

In addition to emphasizing the power disparity between the United States and other nations of the collective defense system, the new weapons lend themselves to arguments that this country can adequately defend itself with forces deployed on its own territory and in the neutral regions of sea, air, and space. Such arguments are highly misleading, as the United States will at the very least continue to require overseas installations for the collection of intelligence from the Soviet Union, ground support of the emerging space systems, naval bases, and for the maintenance, repair, and forward basing of those forces suitable to quick deployment in localized conflicts. As indicated in the prior discussion of satellite systems, the need for such installations is actually increasing. But the range and endurance characteristics of new weapons such as the ICBM and the nuclear submarine will not be ignored by those who, for other reasons, favor a Fortress America strategy, or by those in Allied nations who fear the United States may adopt such a strategy.

Quite probably, therefore, the effects of the new weapons will include that of amplifying divisive influences within the present alliance system, thus complicating the efforts of foreign policymakers to preserve and to strengthen the solidarity of the free world.

It is also apparent that foreseeable technological developments will sharpen existing tensions between the United States and the Soviet Union and provide fruitful sources of new ones. The "political problems" that may result from the extension of air attack, defense and warning systems into the Arctic and ocean areas have already been mentioned; certainly the competitive exploitation of space opens a new arena for the conduct of cold, limited, and even hot warfare. The past controversy over satellite radio channels for the International Geophysical Year is a forerunner of these space disputes; other predictable controversies will involve the extension of national sovereignty and territorial boundaries into space, conflicting utilization of radio transmission frequencies, the identification of "dark" satellites, electronic, and perhaps even physical interference between rival space systems and conflicting activities on the moon and planets.[95] Of these the reaction of both adversaries to the satellite "spies in the sky" now being groomed for their maiden flights will provide an early example.

These problems cannot be evaded on the assumption that some clear distinction exists between military and "peaceful" uses of space. In an age when global warfare is possible and weather control anticipated, even the geographic and meteorological mapping of the earth

[95] For a detailed discussion of these and other foreseeable space disputes see "Survey of Space Law," staff report of the Select Committee on Astronautics and Space Exploration, H. Doc. No. 89, 86th Cong., 1st sess., December 1958. U.S. policy, or more specifically the lack thereof, on these problems is outlined in "U.S. Policy on the Control and Use of Outer Space," report of the Committee on Science and Astronautics, House of Representatives, 86th Cong., 1st sess., April 1959.

from satellites is clearly related to the employment of existing weapons systems and the development of new ones. Satellite and satelloid reconnaissance systems are obvious military tools. The purpose of navigation satellites has been stated as that of enabling ships, combat aircraft, and submarines to determine their position with great precision,[96] a capability requisite to the accurate launching of ballistic missiles. The very uncertainties which now pervade predictive thinking on the military utilization of space make it the more difficult to divide space research into military and peaceful areas.

Like development of the intercontinental missile itself, man's growing ability to utilize space may make international cooperation and control the more desirable, but the more difficult to achieve. The surrender of national sovereignty now believed necessary for an effective international warning system against missile attack is indicative of these problems.[97]

The anticipated weapons will also heighten existing tensions by increasing uncertainties about enemy intentions while multiplying both the means and the speed with which devastating attacks can be launched. It is now impossible to distinguish a missile submarine from other nuclear submersibles underwater, and the same may soon be true of an IRBM-armed merchant ship, a Minuteman-equipped train or barge and, possibly, a satellite bomber. The destructive potential of these weapons, their small size, and their numerous possible disguises also increase the degree of sovereignty that must be surrendered to make feasible their control.

A third area of implications that may be drawn from the course of development in weaponry concerns those technological achievements now possible in tactical systems. The developments earlier mentioned, particularly those facilitating increased air and ground mobility and the spread of increasingly greater firepower to lower echelons of the military, lend themselves to the rapid application of military force in even remote areas of the globe. One implication is that limited or localized conflicts may be much more rapidly initiated, or terminated, than they have been in the past.

These observations lead to the conclusion that the speed and potential decisiveness with which war can be initiated will be increasingly facilitated by the anticipated progress of military technology during the next decade. This refers to the unilateral mechanics of projecting military force, not necessarily to the utility, rationality, or the probability of such action (which may well continue to recede). But since it is the requisite mechanical capability that makes initiation of war possible, initiation of war will remain a course of action open to the potential aggressor for at least the next decade.

The problem for military and foreign policy is therefore how best to remove or avoid the incentives and temptations that might lead the Soviet Union to take such a course. In part, but only in part,

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[96] See the description of the navigation satellite program given by the Advanced Research Projects Agency in House Hearings on Fiscal Year 1960 Defense Budget, pt. 6, Apr. 14, 1959, p. 21. Due to its simplicity and relatively low cost, a navigation satellite network may be the first military orbital system in operation.

[97] The sample system outlined by Western experts at last year's Geneva Surprise Attack Conference included an initial high- and low-level aerial mapping of adversary nations' territories, assessment by roving teams of ground observers, continuous observation of missile sites by resident observer teams, international communication systems with signal delay times of less than a minute, and supplementary ground radars to detect missiles in flight. See the Conference report, cited above.

this may be done by the utilization of military technology to increase the retaliatory hazards to that nation of a surprise attack. Means appropriate to this objective are, as earlier indicated, the multiplication, dispersion, and the hardening or "mobilizing" of those deterrent weapons systems now becomng available. But should this be done, as indeed it must be, there would remain serious instabilities in the strategic equation which portend an irrationally destructive nuclear war. These stem both from the characteristics of modern strategic weapons and from the strategies they are employed to support. It is to these problems that we shall now turn.

Chapter 5. Stability Versus Instability in the Equation of Strategic Power

A. STABILITY AND INSTABILITY

Like so many phrases of these days, the concept of stability is borrowed from physics via mathematics. The reference is to equilibria of various kinds. A physical system is said to be "stable" when alteration in one or more of the component factors of the system tends to be counteracted by compensating alterations in other factors. Such a system is said to be "unstable" if alteration in one factor tends to be increased or multiplied by the operation of other factors.

The example commonly cited is a ball at rest at the bottom of a bowl. If an external force is exerted to move the ball to one side, this force is opposed by gravity. The higher up the ball is pushed, the stronger the opposing force exerted by gravity. When the external force is removed, gravity returns the ball to the bottom of the bowl. The ball in the bowl is in a state that tends toward stable equilibrium. Turn the bowl upside down and the equilibrium becomes unstable. If any external force moves the ball even slightly to one side, it is then reinforced by gravity and tends to cause the ball to roll all the way off the upturned bowl. The ball on top of the upturned bowl is in an unstable equilibrium.

An analogous distinction can be made in the relations between two or more nuclear powers. It is possible to identify elements which tend to make their relationship "stable" and elements which tend toward "instability." If their relationship is stable, any circumstance pushing them toward war will be opposed by countervailing forces that increase in strength the closer these nations come to a showdown. If their relationship is unstable, any circumstance pushing them toward war will be reinforced by other inherent forces making war difficult to avoid.

B. FACTORS TENDING TOWARD STABILITY

The factors tending toward a stable relationship between nuclear powers are the usual ones mentioned by proponents of the concept of nuclear stalemate. The principal stabilizing force is the assumption that the initiator of a nuclear war must expect to suffer damages himself in the course of such a war that will be out of all reasonable proportion to his probable gains. This assumption is supported by the entirely sensible thought that destruction of the type possible with thermonuclear weapons is a disaster to him who receives it of an entirely different order of magnitude than any value to be obtained by bringing nuclear destruction to others.

To the Russians, the loss of Moscow could hardly be compensated for by their knowledge that New York and five other U.S. cities had been destroyed. Similarly, the destruction of any six Russian cities could hardly compensate us for the loss of New York, Chicago, or Washington. And if the stake is victory or defeat in nuclear war, it is possible that the retaliatory blow would amount to hundreds of weapons on target, not just one. The principal factor tending toward stability in the relationship between nuclear powers, then, is that very many weapons on target may be necessary for victory, while very few enemy weapons on target may rob one of any reasonable fruits of victory.

There are, however, very important elements which can tend toward instability in the relationships between nuclear powers. The remainder of this chapter will deal with certain of these factors. Four classes of such factors will be considered. The first class will include tendencies toward instability arising from the characteristics and interactions of weapons systems deployed by two or more nuclear powers—this will be referred to as "structural instability." The second class will include tendencies toward instability arising from the dynamics of differential time-phasing in the development or deployment of weapons systems. The third class will include tendencies toward instability deriving from the strategic or policy positions taken by the nuclear powers. The fourth class will cover instability arising from the spread of strategic nuclear weapons to a large number of countries.

C. STRUCTURAL INSTABILITY

It has generally been true of warfare, no matter what the nature of the weapons permitted by the then state of military technology, that there were certain potential advantages to the initiative. It is true, of course, that at certain periods of warfare the advantages of defensive weapons and positions tended to outweigh the advantages of the initiative. This may have been true during periods when the art of fortification had not yet been equaled by techniques of conducting siege operations. It was probably true during the period when the trench and the machinegun had not yet been met by the tank and the airplane. But generally the initiative has been one of the essential keys to military strategy and has been emphasized, perhaps overemphasized,[98] by almost all students of the subject.

The pressure to get there "fustest with the mostest" was one of the key factors of inherent structural instability in the European military situation in 1914 which led to the outbreak of World War I. At that time it was considered by all European military planners that the key to any meaningful military victory was decisive success in the initial battles of the war. The key to such success in turn was judged to be speed and efficiency of mobilization of their already trained manpower relative to the speed and efficiency of their opponents' mobilization. It was above all essential not to allow your opponents to gain the advantage of starting their mobilization earlier than your own.

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[98] See Bernard Brodie, "Military Strategy in the Atomic Age" (Princeton, N.J., Princeton University Press, 1959), pt. I, on this point.

It will be recalled that after years of intense effort to achieve the speediest possible mobilization against their major adversaries, the European powers found themselves, in 1914, in the midst of a Balkan crisis with which they were incapable of dealing prudently, because their mobilization plans had made the situation structurally unstable and had thus deprived them of freedom of action in a minor crisis. None of the powers concerned, except possibly the Serbians, wanted a great war—it is almost certain that the great powers (Germany, Austria, Russia, France, and Great Britain) did not. But the Serbians wished to dismantle the Austro-Hungarian Empire, and the Austrians wanted to punish the Serbs, and the major powers on each side were committed to support their allies. The sequel is familiar. The Tsar sought to manifest his support of the Serbs by mobilizing only against the Austrians, but his general staff informed him that such a partial mobilization was impossible without so disrupting their general mobilization plans that Russia would be left virtually naked to a German attack should the Germans mobilize. So, rather than fail his ally (who had been issued an ultimatum by the Austrians), the Tsar concurred in a general mobilization. Thereupon the Germans mobilized and attacked the French, because their mobilization plans required that their western frontiers be pacified prior to taking decisive action on the eastern front, but they could not afford to let the Russians get the jump on them on the eastern front.

The characteristics of today's weapons systems can lead to structural instabilities that have a comparable and potentially far more significant effect than did the advantages of fast mobilization prior to World War I.

The most obvious characteristic of today's weapons systems which tends toward instability is vulnerability of striking systems to counterforce attack. If one counterforce weapon on target can eliminate or render useless many or even several of the defender's weapons, there is an enormous and obvious advantage in the first strike.

Secondly, defensive systems are generally much more effective against small numbers of attacking weapons than against weapons arriving in sufficient numbers to saturate the defenses.[99]

Thirdly, defenses anticipating a coming attack are much more likely to be effective than defenses surprised or only suddenly and uncertainly alerted.

If such continue to be the characteristics of strategic weapons systems, the initial exchange in a nuclear war—the first strike by one side and the retaliatory second strike by the other side—would in all probability result in a great disparity in surviving weapons and their essential supporting systems. The first strike would have knocked out many, the second strike few. A second exchange would probably greatly magnify the disparity. It is hard to visualize a third exchange of any military significance. And a rational continuation of the war with one side having achieved dominance in nuclear striking power is almost inconceivable.

[99] This is significant, particularly in defense against manned bombers. There is now no active defense whatsoever against incoming ICBM warheads; this fact of military life puts an obvious premium on the first-strike destruction of enemy missiles before they can be launched.

If, and as long as, such conditions exist, military planners, who must consider what action should be taken in the event deterrence fails, have no choice but to concern themselves with all those things which would give them and would deny to their potential opponents the advantage of the first strike. They are forced to consider preemptive attack.[1] They are also forced to strive for warning systems and striking systems which permit of extremely fast reaction, a reaction so fast that they could get off their first strike before the enemy first strike hits its targets.

But such trigger-fast warning and reaction systems introduce still another element of instability into the structure—the possibility of war by accident.

One example is already familiar. SAC depends for its warning of a surprise attack upon detection radars which cannot always discriminate, for example, between a flight of geese and a flight of Russian bombers. It is because of this possibility of error that the widely publicized "fail-safe" procedure has been worked out—a safeguard by which bombers take off upon receipt of a suspicious radar warning but are given a geographical limit beyond which they may not penetrate unless they receive specific orders from the highest authority to do so (after the cause of radar blips has been checked to make sure they indicate bombers and not geese). Radar systems now being built to provide warning of an ICBM attack are perhaps less likely to be confused by geese, but they can be confused by meteors and other celestial phenomena. And no one so far claims to have worked out a "fail-safe" procedure for our ICBM's.

"Fast reaction" sources of instability, then, are a threat of no small moment. They produce a dismaying prospect of war, because the actual decision to push the button may be a rational one but based upon false premises. Moreover, such technical sources of instability do not, in principle, play favorites between the adversaries because they are a function of the performance characteristics of the weapons systems. They therefore suggest common interests among adversaries in measures (including, perhaps, agreed arms limitation and control) designed to impose rational control upon the accidental.

D. INSTABILITY ARISING FROM DIFFERENCE IN TIME-PHASING

In interrogations of Japanese leaders after World War II, an effort was made to discover the reasoning behind the attack on Pearl Harbor and its timing. Among the factors weighing heavily on the minds of the Japanese strategists was their assessment that, up to January 1, 1942, they would have sufficient stockpiles of petroleum to cover their requirements during the initial phases of a war, at least enough to cover them until they could get supplies from captured fields in Borneo and Indonesia flowing to the Japanese home islands. They anticipated that, if they did not go to war promptly, the U.S. embargo on oil shipments and iron scrap would so rapidly cut into their stockpiles of those commodities that after January 1, 1942, they would no

[1] A preemptive strike has been defined as "a desperate last-minute effort to seize the initiative from the enemy who is about to attack or in the process of doing so" (Raymond L. Garthoff, "The Soviet Image of Future War," Public Affairs Press, Washington, 1959, p. 14). It is usually distinguished from preventive war or the deliberate initiation of hostilities on one's own time.

longer be able to see their way through even the intial phases of a war. They felt themselves, therefore, in a time squeeze. They had to hit before a certain date or not at all. They hit before that date, not because they had any clear idea how the war would turn out, but because they thought it certain they would be a second class power if they did not hit before that date.

Similar instabilities can now arise from differences in the time-phasing in the development or deployment of nuclear weapons systems. When one side believes it has a potentially decisive advantage in the nuclear arms race but can foresee that within a given time period that decisive advantage will evaporate, there are strong rational grounds for its attempting to exploit that advantage before it disappears. It was this line of thought that prompted the voices calling for preventive war, an expansion of the Korean war with the employment of nuclear weapons, or negotiations backed by an ultimatum, in the period of 1949 through 1954. In that instance other policy considerations were considered more important, and the voices urging us to exploit our assumed decisive advantage while we still had it were not heeded.

But such situations can arise again in an arms race characterized by as dynamic technological developments as we have witnessed in recent years. Let us suppose the Soviet Union were to develop a potentially decisive counterforce missile capability before we could develop and put in place the warning systems and hardened mobile or concealed weapons systems sufficiently diverse, numerous, and protected to frustrate such a Soviet counterforce strike. Who can predict with certainty that the Soviets would not, under those circumstances, exploit their capability before they lost it?

Other possible examples of this type of instability could be cited. The essential point is that changes in the relative strategic posture of nations can cause instabilities. The fact that modern weapon systems take many years to develop and then to deploy in adequate numbers for strategic significance makes it difficult to avoid such instabilities through prompt compensatory action. The periods of such instability arising out of difference in time-phasing of the development or deployment of weapons may therefore be quite extended and dangerous.

E. INSTABILITIES ARISING FROM POLICY POSITIONS

Tendencies toward instability can also arise from policy positions taken by one or more of the nuclear powers for reasons not directly related to the structural relationships of opposing nuclear weapons systems nor to anticipated changes in those relationships arising from differences in time-phasing. Such tendencies to instability we may call "instability from policy."

If a nuclear power's general policy is either overaggressive or overextended in relation to its nonnuclear strength (and if it does not enjoy nuclear predominance), dangers of "instability from policy" are apt to arise.

Under these conditions there exists a tendency to raise the "level of confrontation." In order to cover the disparity between its policy commitments and its nonnuclear power, a nation may be tempted

to exploit its opponent's concern over the possibilities that a nuclear war might erupt from the matter at issue. By threatening action more drastic than the circumstances warrant, however irrational the execution of the threat might seem, a state may hope to restrain its opponent from pushing an issue to a showdown in view of the uncertain consequences.

It could today be argued that an overambitious Soviet drive for general hegemony tempts the Russians to brandish their nuclear weapons, to threaten general destruction and to declare the impossibility of limiting any war, either geographically or as to the weapons employed. By these methods, they hope that by sufficiently weakening the resistance of their possible opponents, they will be able to transform an otherwise unrealistic policy into a realistic one.

On the other hand, it could today be argued that in order to cover an acute inadequacy of trained and organized men equipped with nonnuclear weapons, the West is tempted to brandish its nuclear weapons, to threaten general destruction, and to declare the unlikelihood that the response to any limited Communist aggression could be restricted to the area of the aggression or limited to the weapons initially employed.

It may well be that neither side would in fact act precisely in accord with its threats. But there can be little doubt that a strain upon nuclear stability can result from the interaction of such policy positions. Positions taken come to involve the nation's prestige. A contest of will can be induced in which both sides may believe it possible to outbluff the other. Even more dangerous is the temptation to make the nuclear support for general policy positions more credible by giving oneself no other option but nuclear war if on a particular issue, such as Berlin or the Chinese offshore islands, the nation's basic prestige and honor is pushed to the point of showdown.

Limited aggression may be a more risky and difficult policy for an aggressor to pursue if the nuclear situation is inherently unstable. But our policymakers must then decide whether they are more concerned about the danger that an unstable nuclear relationship will become unstuck and degenerate into an unwanted general war, or that a series of limited aggressions beyond our capacity to deter or defeat with nonnuclear means will lead to effective Soviet hegemony.

F. N^{TH} COUNTRY INSTABILITIES

There are well-informed students of the problem who believe that the instabilities we have so far discussed may be manageable as between two hostile nations or two well-disciplined blocs, but that a multiplicity of nations each attempting in its own way to build up strategic nuclear capabilities, and to use them in support of its own policy, will present a completely unmanageable situation.

It can be argued that no nation not of the very first rank has the spread of territory usefully to deploy a dispersed, variegated, and secure retaliatory nuclear capability and the resources and scientific talent to develop and maintain one.

It can further be argued that no country without a secure retaliatory capability can do much threatening or bluffing that it will use the capabilities it has in a first strike of its own. There is too much

danger that such threats or bluffs, if against a strong nation, will invite a counterforce strike which the threatening nation has no capacity to repel or to absorb, or, if against a weak nation, will invite interference by nations of the first rank who will not wish to see such threats or bluffs be effective.

There can be little doubt, however, that the spread of strategic nuclear weapons among many countries, countries divided among loose alliance systems, or neutral and therefore objects of competition between such systems, can increase tendencies toward instability. If Communist China possessed a strategic weapons capability which we believed we could eliminate in an initial blow, and if the Chinese Communists used the existence of this capability to back up an aggressive policy of expansion, we might be much tempted to eliminate that Chinese capability while relying upon our overall retaliatory strength to keep the Soviet Union from backing up its ally—and we could be wrong in our estimate that the Soviet Union would be so restrained. Comparable situations can be imagined in which the Soviet Union might make a similar error in judging the circumstances under which we might feel honor bound to back up our allies.

At a minimum, the impossibility of foreseeing all the possible combinations of capability and policy that could arise in a world where many countries have strategic nuclear weapons gives grounds for great concern.

Chapter 6. Arms Control and Other Measures for Stability

Let us suppose for the moment that the United States has decided to give high priority to lessening the risk of total war by purposefully striving for a reduction in nuclear instability in the decade ahead. How might this be accomplished, at what price, and what might be the logical corollaries of such action?

Several variant courses of action are conceivable in this regard, some of them suggested by the sources of instability discussed in the preceding chapter. The United States, for example, could build and deploy retaliatory weapons systems of such security and mobility as to reduce the present Soviet temptation to strike first. Multiple attack warning systems, capable of verifying each other's signals, could reduce the dangers of war by accident or miscalculation. This Nation could modify its policies to reduce their dependence on threats of total war or on continued nuclear instability. We should be able to attain a measurable increase in nuclear stability by our own actions, quite apart from what the Soviet Union does, or does not, agree to do. Furthermore, our actions could be so designed that they will induce concurrent actions directed toward nuclear stability by the Soviet Union and other countries. The achievement and maintenance of such stability could be made a prime objective of our negotiations looking toward the international regulation and control of armaments.

The purpose unifying all of these actions would be the attainment and continuance of nuclear stability. A most important corollary, however, would be that we and our allies would have to find and develop means other than the threat of strategic nuclear retaliation to support our foreign policies and to meet many of our security

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requirements. It is probable that this would take very great efforts and require substantial sacrifices. A decision to seek nuclear stability would imply a willingness to make such efforts and to endure such sacrifices.

The remaining portions of this chapter will examine possible means of lessening the risk of total war in greater detail.

A. UNILATERAL U.S. ACTIONS

It has been previously suggested that a principal source of instability is the advantage intercontinental missiles give to the side that strikes the first blow, particularly when its opponent's strategic power is centered in a force of manned aircraft. There is now, however, wide agreement that, if our resources were directed to the development and deployment of weapons systems specifically designed to defy location or to otherwise survive a surprise attack, much could be done to reduce this present source of instability. Mobility or hardening, concealment, multiformity of retaliatory systems and sheer numbers of dispersed and variegated weapons could make it extremely difficult for the Soviet Union to have a high degree of confidence that it could, in the first blow of a total war, knock out a high percentage of its adversary's retaliatory power. The obstacles to lessening the chance of total war in this respect do not appear to be primarily technological. They rise instead from considerations of cost, the leadtime requisite to development of complex modern weapons systems, and the competing demands of those who advocate alternate weapons designed to give the United States a capability of striking the first blow itself, should this be necessary to fulfill our foreign policy commitments. Perhaps the most difficult of these obstacles is time itself. To achieve nuclear stability now would require the weapons systems presently programmed for appearance in 1963–65. By 1965 we might well need those systems planned for 1970. A substantial degree of stability can in the interim be achieved by gap-fillers and protective expedients, systems imperfect but in being or achievable by the early 1960's.

The more secure these retaliatory systems are from destruction by an initial counterforce blow, the less this nation would need to rely upon a capacity for "hair trigger" response. If we had a substantial number of Polaris submarines concealed in the ocean depths, hardened or mobile Minuteman solid fuel ICBM's in position, and long-endurance aircraft armed with ballistic missiles dispersed in the sky above, we could then afford to verify and evaluate early and perhaps mistaken signals of enemy attack before pressing any launching buttons. If the early warnings were not confirmed by the arrival of enemy missiles, there would even be time for communication with the presumed aggressor before launching our retaliatory strike. We would not have to decide this question in minutes or under the intolerable pressure of knowing that, if the missiles were actually on their way, our retaliation must be launched immediately or not at all. We could thereby reduce the danger that unilateral action, taken in haste and quite possibly on the basis of false or misleading information, would bring about a war that could have been avoided.

The United States could also do much to reduce those instabilities arising from peacetime military strategies and policy positions. If it accepted the corollaries of a decision to opt for nuclear stability, and had determined to attain its foreign policy objectives by means other than threats of nuclear war, it would then become inconsistent to rattle our strategic weaponry, or to declare that the response to localized Communist aggressions could not be limited to the area of the aggression or to the weapons initially employed. It would also be inconsistent, and be in fact self-defeating, to continue the deployment of intermediate-range ballistic missiles on soft, unconcealed, immobile and undispersed European sites within easy range of Soviet IRBM's. Such weapons, so deployed, are useful only in a first strike: it is extremely unlikely that they would be available to us for a retaliatory blow. They may have limited utility in the deterrence of non-nuclear Soviet aggression, given the absence of more appropriate military capabilities for this purpose, but they add to the risks of nuclear instability.

In sum, much could be done unilaterally to move toward strategic nuclear stability. But many serious problems would remain. The race for technological improvement would continue unabated, with its heavy costs and uncertainties. The spread of strategic nuclear systems to other countries would continue with all the possibilities for as yet unforeseen instabilities which that implies. And we would be faced with the immediate necessity of finding and developing nonstrategic nuclear supports for all those elements of our foreign and military policies which are now supported by the threat of nuclear retaliation. In particular we and our allies would have to radically increase the numerical strength, firepower, mobility, training and coordination of our conventional military forces. There are good reasons, therefore, for seeing whether and how best to get the cooperation of others in moving toward stability.

B. RECIPROCAL ACTION

Instability in the strategic nuclear equation is obviously a concern not limited to the United States. It is the primary concern of people everywhere. There is no reason to believe that even the Soviet leaders are merely engaging in duplicity when they express their anxiety about the sources of nuclear instability. They cannot view lightly the instabilities that stem from a powerful first-strike capability, itself highly vulnerable to a first strike by the enemy. Nor can they easily dismiss the dangers of accidental war. They may, of course, believe that they are the more advanced in certain aspects of the arms race, and view certain instabilities as favorable to the retention and expansion of their domain. But their position in the past was quite different. Today they may brandish their rockets, but "brinkmanship" was not initiated by them and it is not a Soviet monopoly. There are also grounds for believing that they too fear the spread of strategic nuclear weapons to smaller or less responsible nations.

If there are common interests among the world's governments and peoples to reduce sources of nuclear instability, it should not be impossible to induce a measure of reciprocal action from others if we ourselves move in this direction.

The current situation with respect to the testing of nuclear weapons illustrates both the possibilities and the limitations of reciprocal action. There is no formal international agreement regulating or prohibiting such tests, but it would be difficult for the United States to resume the testing of nuclear weapons on a unilateral basis. The political and propaganda price of such action would be high and the Soviet Union could then resume its own testing program, claiming that we had, by our action, compelled it to do so. The Soviets, of course, are similarly restrained from initiating detectable tests.

There is, on the other hand, now no inspection procedure to guarantee that the Soviets or their satellites have not continued secret underground tests, and the French will probably go forward with at least one round of nuclear explosions in the Sahara despite international pressures and those of public opinion.

Thus, even though much can probably be done through example, political pressure, and diplomatic action to get others to move toward nuclear stability, there will still be areas in which formal agreement, backed by international control and inspection machinery, might make a further contribution to stability.

C. INTERNATIONAL ARMS CONTROL

Mr. Khrushchev has proposed total disarmament down to the level of those internal police forces required for internal security. It remains to be seen whether the inspection procedures, the measures and forces necessary to resolve and enforce the settlement of international disputes, and a phased approach to such an objective can be satisfactorily negotiated. But even on the unlikely assumption that these hurdles can be overcome, there are even more basic objections which need to be thought about. They relate to the question of just how "stable" a completely disarmed, multinational world would actually be.

It is patently impossible to reverse or to otherwise "undiscover" those scientific and technological advances in weaponry that have already been made. In a world totally disarmed, if conflicts broke out between nations over vital political and economic issues—or even threatened to break out—a hectic race to manufacture and deploy the most efficient and destructive weapons made possible by technology could be expected to follow immediately. Perhaps one adversary would be in a relatively favorable position to win such a race. In the final analysis modern technology and its weapons would still determine the outcome. Perhaps it is better that the influence of such weapons be brought to bear at the end of such a conflict rather than at the beginning, but that it can be permanently banned from influencing vital decisions in a divided world seems hardly possible.

Furthermore, it is almost as difficult to keep the clock of scientific progress standing still as it is to turn it back. Scientists will continue to think. Laboratories and computers will continue to add to scientific knowledge. Perhaps the focus of scientific thought can be turned to other subjects than armament, but that it can be kept from having any bearing on military technology is beyond the realm of the possible.

It is also doubtful that an inspection system could be devised which could disclose with a high degree of certainty that all nuclear material produced in the past has been accounted for. Geiger counters cannot detect the presence of plutonium, even at close range, if it is concealed in a lead box or underground.[2] It has been remarked that the principal tools international inspectors would need to locate hidden plutonium would be shovels and screwdrivers. There seems to be no way of attaining a high degree of assurance (even with the most elaborate inspection systems now conceived) that material sufficient for, say, a hundred nuclear weapons had not been secreted.

The point is that absolute stability is probably not attainable through arms control, disarmament and inspection. Even more important, it is not certain that the greatest attainable stability is achievable by maximum disarmament.

Those who work in the field of electronics speak of the "noise level" of their systems. All the random and uncontrollable forces operating on and within the system are called "noise". If the noise level is high, it will blanket out weak signals which the electronic system is attempting to handle in an ordered way. If the signals are strong, they will come through above even a considerable intensity of noise. There is thus a relation between the signal strength that must be maintained and the noise level of the system if it is to operate in a controllable way.

There may well be an analogous relationship between the level and character of armaments permitted under an international agreement and the number of concealed or clandestinely manufactured weapons that could disrupt the system. An arms limitation agreement between the United States and the Soviet Union which permitted each side to retain a number of retaliatory systems capable of surviving a first strike from the other, but which were insufficient in number, destructive power, and accuracy to execute a first strike themselves, could create a ratio of controlled to uncontrollable force favorable to nuclear stability.

Let us assume that such an arms control system permitted each side to maintain 200 or 300 strategic nuclear weapons so hardened, mobile, and dispersed that to eliminate any one of them would require a substantial number of attacking weapons of great destructive power and accuracy. Under such conditions even the surreptitious addition of several hundred weapons to the attack capabilities of one side or the other would not be sufficient to upset the stability of the system. Any temptation to violate the system would be restrained by the knowledge that a very great effort, indeed an effort so great as to run a high risk of detection, would be required before the inherent stability of the system could be overcome.

It is highly unlikely that any foolproof arms control and inspection system can ever be devised. But there are other important considerations bearing on this issue. The first is that, unless a determined effort is made to achieve some form of nuclear stability, the prospect for the next decade is one of high instability and consequent risk of allout nuclear war. We will have to run very hard in the arms

[2] It has been said with authority that properly insulated nuclear material within a bomb defies detection by the most sensitive of existing instruments at distances of only a few yards. See the United Nations Surprise Attack Conference report, op. cit., Annex 13 by the Western Experts, p. 4.

race just to keep the very dangerous position which we now occupy from becoming even more dangerous. The second consideration is that other nations, in addition to the United States, have an interest in reducing the instability of the nuclear relationship.

One of the most difficult problems to be surmounted in this regard may be that presented by the accelerating rate of progress in military technology. It is conceivable that the preamble to any arms control and regulation agreement should declare the intention of the parties to preserve conditions making continued nuclear stability possible. One of the commitments mutually undertaken in pursuit of that purpose could be openness of scientific and technological research. Such a commitment may not be enforcible in detail. Violation, however, to be effective would probably have to be on a scale lending itself to detection.

Another difficult problem would be that of sanctions. What could be done, short of war, if one side or the other believes the agreement is being violated? Inspection and investigation procedures could be available to the accused side to demonstrate that the accusations were false, if that is the case. If one side, however, willfully violated the agreement and persisted in its violation, what could be done? Various possibilities are conceivable. One would be then to declare the agreement voided and to proceed to full mobilization. The secure retaliatory capabilities preserved under the agreement should give a high measure of protection against the threat that the original violator could achieve a decisive counterforce capability before mobilization added greatly to the defender's capabilities.

A further difficulty arises in relation to countries other than the United States and the Soviet Union. How is their security to be preserved, particularly against threats or encroachments by powers of the first rank? Again various possibilities are conceivable. One would be an international police force of some considerable size and strength. This possibility involves many problems concerning the manner in which such a force would be controlled, staffed, armed, and based, and the way in which decisions would be made as to when, and against whom, it intervened. It is hard to see how either the Soviet Union or the United States could agree to the establishment of a force sufficient in size and power to intimidate it if there were any possibility that this force could fall under the effective control of its enemies. Another possibility is that less powerful countries be permitted a small number of tactical atomic weapons to be used only in defense against otherwise superior external forces and only in and over their own territory.[3]

A few words may also be said on the problem of inspection under an arms control agreement. Inspection is likely to be ineffective unless it is coupled with a system calling for the disclosure of pertinent facts by the nation being inspected. The inspection system could then be designed to test the accuracy of these disclosures. Overlapping sampling techniques, coupled with more detailed investigation where questions arise, can give a much higher degree of confidence that there has been no violation than can a system of inspection de-

[3] This proposal is made and detailed in Paul H. Nitze, "An Alternative Nuclear Policy as a Base for Negotiations," East-West Negotiations, the Washington Center of Foreign Policy Research, 1958, pp. 28–37.

signed to reveal everything itself. Much further technical work needs to be done to work out the possibilities and limitations of various techniques of inspection such as aerial photography, monitoring of factory production, and recording of electric power consumption.

Two further difficulties in achieving increased nuclear stability through arms control should be mentioned. The first is the problem of the asymmetry in the information that we and the Soviet Union now have about each other. The Soviet system lends itself to secrecy and ours does not. The Soviet leaders are unlikely to feel, therefore, that a scheme for equal exchange of information involves equal sacrifices toward stability by both sides. The second is that an effective and comprehensive scheme must include all important countries. An agreement which did not include Communist China, for example, would present most serious risks for our side.

A necessary corollary of seeking nuclear stability through arms control agreements might therefore be a willingness to negotiate with the Chinese Communists on a basis reasonably likely to be acceptable to them. This might well require some radical and perhaps unwelcome changes in our policies toward that nation, including that of our resistance to its membership in the United Nations.

In summary of this chapter it may be said that much could probably be done toward increasing the stability of the strategic nuclear equation. There is, however, no easy and simple road to success. Much could be done through action by the United States alone. More could be done if our action were joined by the reciprocal action of others. Still more might be possible through the addition of agreed international control and inspection machinery. But there are serious policy issues and corollaries involved in the decisions seriously to seek stability. It would be an error not to see and deal with these issues as best we can and, if possible, in advance, if this is the road we firmly decide to follow.

PART D. THE DEVELOPMENT OF DETERRENT AND COUNTERDETERRENT STRATEGIES

The purpose of a military strategy is to determine the manner in which a nation's armed strength will be utilized to achieve the aims of its foreign policy. Expressed in the most general terms, the principal aims of U.S. foreign policy that call for military implementation are, first, to frustrate Communist efforts at world hegemony and, second, to avoid a nuclear war that would threaten this nation and its allies with unprecedented devastation.

In the period since World War II the United States has developed and pursued a national military strategy both more explicitly and more consistently than ever before in its history. In the course of time this strategy has come to be almost exclusively one of nuclear deterrence,[1] signifying an extensive reliance on strategic nuclear power for the support of American foreign policy.[2] It is the purpose here to examine the evolution of this strategy in terms of challenge and response and in the light of those pivotal postwar developments in military technology previously described.

The strategy of nuclear deterrence evolved in response to the very specific threat of a nuclear attack on this country that was implicit in the August 1949 explosion of the first Soviet nuclear device. Postwar American military strategy had, prior to this event, been in a state of flux as various and sometimes conflicting attempts were made to reconcile the desire of the American people for a relaxation of military effort with the mounting threat of Communist conventional probes in Europe and the Middle East. It was generally agreed that this Nation, having fought in two world wars to prevent the domination of Europe by a single power, could not permit the Red Army to achieve what the Wehrmacht had been barred from. But the American people were tired of war and felt entitled to a diminution of military tension and sacrifice. These desires were reflected in the almost frantic demobilization of American military power that marked the early postwar years.

As the pressures of Soviet expansionism continued to mount, the U.S. strategic response was, not surprisingly, a rebirth of those concepts that had proved valid in World War II. This was indicated

[1] A distinction is made here between the strategy of nuclear deterrence, a broad reliance on nuclear power in support of foreign policy, and the strategic deterrent itself which is the force employed to discourage direct nuclear attack upon the United States. The rationale for this distinction is that deterrence itself is not a strategy, but an effect stemming from the mere existence of military force. Provision of a strategic deterrent force, therefore, stems from a strategic decision but represents only the barest bones of a strategy.

[2] Outstanding discussions of the rationale, prerequisites, and problems of nuclear deterrence include: Bernard Brodie, "Strategy in the Missile Age" (Princeton University Press, Princeton, 1959), especially ch. 8; W. W. Kaufmann, "The Requirements of Deterrence," in W. W. Kaufmann (ed.) "Military Policy and National Security" (Princeton University Press, 1956); Glenn H. Snyder, "Deterrence by Denial and Punishment," Research Monograph No. 1 (Center of International Studies, Princeton University, Jan. 2, 1959); and Albert Wohlstetter, "The Delicate Balance of Terror," Foreign Affairs, vol. XXXVII, No. 2 (January 1959), pp. 211–234.

by the emphasis placed on the stockpiling of strategic materials, by the establishment of the National Security Resources Board to plan for war mobilization, and by efforts to maintain manpower reserves that included a proposal for universal military training. Corresponding strategic concepts placed heavy reliance on airpower, the existence of superior naval power, and the ability to mobilize both manpower and economy in any crisis carrying the threat of war.

Soviet imposition of the Berlin blockade in 1948 was such a crisis and could certainly be construed as the most serious and direct Communist challenge to the power of the United States in the immediate postwar period. The American response was renewed emphasis on collective defense which led to the formation of the North Atlantic Treaty Organization and the deployment of U.S. nuclear airpower abroad.

The strategic priorities of this period were clearly defined by Gen. Omar Bradley in his testimony before the House Foreign Affairs Committee on July 29, 1949. First priority was given to "our ability to deliver the bomb", followed, in this order, by the capability of Western fleets to keep the sealanes open for transport of war material, a hard core of defensive allied ground forces-in-being on the Continent and, finally, the provision of air defense and tactical airpower by England and France. This was a strategy of collective defense clearly aimed at deterrence of the potential aggressor from Europe and in Europe.

Announcement of the Soviet atomic explosion in the fall of 1949 presaged a considerable revision of these concepts. The Soviet achievement meant not only that the Soviet threat to our allies and overseas outposts would soon be gravely increased, but that, within the span of a few years, the security of the continental United States itself would be endangered as it had not been for more than a century. It was this latter threat, coupled with the low esteem in which active air defense systems were held at the time, that made creation of a strong strategic air arm the first defense priority. Its purpose was to establish a counterthreat of nuclear retaliation capable of deterring the Soviets from ever deciding to strike at the United States.

"Deterrence" now acquired a new significance. It had previously meant such support for the ground defenses of NATO members that an aggressor, denied the opportunity of achieving a quick and easy victory, would be deterred from attack by the fear of intervention by U.S. strategic air forces and allied reserve components. Now the deterrent mission was enlarged to include dissuasion of an all-out nuclear attack upon the United States itself. It was assumed this task required a strategic retaliatory force superior in size to its Soviet counterpart. The result was a national commitment to the achievement of superiority in nuclear striking force, and it was the vast strategic force resulting from this commitment that was eventually to shape American strategy in areas distinct from its initial role of deterring a direct attack on the United States.

The immediate change, however, was one of emphasis rather than of direction. It remained the policy of the United States "to build the balanced collective forces in Europe that will continue to deter aggression after our atomic advantage has diminished," as the Secretary of State stated in 1951. The conviction also remained that our forces could prove effectively deterrent only if the West could confront the

Communist bloc with balanced military capabilities ranging from a strategic retaliatory force at one extreme to forces at lower levels that could be expected to deter or defeat aggression in Europe and Asia without the support of strategic nuclear retaliation that was threatening to become self-destructive. Events in South Korea in the summer of 1950 emphasized the importance of nonnuclear ground and tactical air forces to the containment of communism and that U.S. military power was seriously deficient in this regard.

It was at this strategic picture that a "new look" was taken in 1953 and 1954. By then the striking power of the Strategic Air Command, based upon mounting inventories of B–36 and B–47 bombers and improved fission weapons, had reached impressive levels. Congress and the public had in addition grown restive over the cost in blood and treasure of the Korean war and weary of a conventional military effort that seemed to offer no chance of success or victory.

It fell to the Secretary of State to make the presentation of a new strategy and to take the brunt of the critical reaction. In his now famous speech before the Council on Foreign Relations in January of 1954, Mr. John Foster Dulles announced a basic policy decision "to depend primarily upon the capacity to retaliate, instantly, by means and at places of our own choosing." This implied that the military had now been authorized to plan on the assumption that, should deterrence fail, nuclear weapons of the U.S. strategic force would be utilized rather than held in reserve as a last resort to be avoided if at all possible.

While the new strategy, like its predecessor, rested on the "inherent right of individual and collective self-defense", it was not a defensive strategy in the common meaning of this term. The Secretary of State himself pointed out the contrast between "deterrent power" and "local defensive power." Reliance on local defensive forces was to give way to dependence on the threat and, if necessary, the employment of the strategic nuclear counteroffensive that became known as "massive retaliation." Now a potential aggressor, whether or not he was contemplating the use of nuclear weapons, was to be faced by the power and the will to furnish so massive a response that he could not hope to gain more than he was sure to lose.

Announcement of this "new look" also signaled a change in this country's attitude toward collective defense. The nature of the security guarantee given our allies changed from a promise to reinforce threatened allies with forces appropriate to local defense to the pledge to punish an aggressor with nuclear weapons at places of our own choosing. The new strategy did not eliminate the need for local defenses, whose purpose, as was later explained in relation to NATO, was now to compel the enemy to commit sufficiently clear-cut aggression as to trigger the nuclear response and, hopefully, to prevent occupation of the allied nation before the U.S. nuclear attack could take effect. It was noteworthy that the speech announcing the new strategy did not contain any reference to the existence or the potential of Soviet nuclear power. This omission was perhaps due to the Secretary's immediate concern with the Far East where the Chinese Communists, who possessed no nuclear weapons, were adding to the troubles of the French in Indochina. It must also be said that, as its

advocates made clear, the purposes of the new look were as much economic as military.

The consequences of the new strategy soon became evident. A concept of preparation for "the long haul" was introduced by the United States at the April 1953 meeting of the NATO Council and was followed by reductions in the force levels that NATO members had been expected to reach. In December 1954, NATO members were authorized to plan wartime operations on the assumption that atomic weapons would be used from the outset; NATO forces would now balance those of the presumptive opponent only insofar as nuclear weapons compensated for numerical weakness. At the time such weapons were strategic, and their employment, or nonemployment, was outside NATO's control. The assumption was that U.S. strategic power, rather than localized NATO defenses, would suffice to deter Soviet military aggression in Europe.

It was thus that the national military strategy changed from one committed, at least in principle, to a reliance on local defensive forces to deter an aggressor by denying him the opportunity of a quick and easy victory, to a strategy of deterrence based primarily upon nuclear-armed strategic forces. In terms of deterring a direct attack on the United States there was no alternative to the threat of nuclear retaliation once the Soviets had acquired weapons against which there was no defense in the traditional meaning of resistance to attack. This new strategy was then extended to cover the older threat of conventional military aggression on the erroneous assumption that what would deter the Communists from the one would deter them equally well from the other. But it also reflected a desire to build and support the requisite strategic force with assets diverted from the creation of those tactical forces which could have given substance to a strategy of local defense.

It is, to say the least, unfortunate that the capacity to retaliate instantly at places of our own choosing, which had emerged as a by-product of the strategic deterrent force, was to prove no more a Western monopoly than had the nuclear weapons themselves. Little more than 2 months after Secretary Dulles had told the Nation that members of the Southeast Asia Collective Defense Treaty Organization would "rely largely upon mobile allied power which can strike an aggressor wherever the occasion may demand", 15 Soviet Bison long-range jet bombers flew over Moscow's Red Square to signify a major advance in Soviet capability to strike at targets within the United States. Fifteen months thereafter the American people were told, in the course of the Symington committee's airpower hearings, that the Soviets would soon be producing jet bombers at a rate twice that of the United States.

Now the very ability of SAC to deter a direct attack on the United States was believed to be at issue; its commander, Gen. Curtis E. LeMay, argued that, being barred from striking first himself, he must have a strategic force several times that of the Soviets' in order to have sufficient retaliatory force left after a Soviet first strike. This objective, which was soon to receive national acceptance, called for sufficient bombers to accomplish on a second strike what the Soviets might accomplish by striking first.

To create a force of this size required an extraordinary increase in SAC's power to deliver a first or a second strike, thereby adding to the attractiveness and apparent feasibility of applying the strategy of nuclear deterrence to the threat of Communist aggression in Eurasia. But the growth of the Soviet nuclear force was bound to restrict SAC's freedom of action in this regard and consequently to degrade the deterrent value of threatening to employ SAC against any aggression that falls below the strategic nuclear level. Such a restraining influence might be called "counterdeterrence" from the Soviet viewpoint. Its influence was reflected in Secretary Dulles' address to the Dallas Council on World Affairs on October 27, 1957, a speech in which the Secretary referred to the possibility of localized Communist aggressions and stated "we and our allies should, between us, have the capacity to deal with these without our actions provoking a general nuclear war."

It must be remembered that the opportunity to discourage all forms of Communist military aggression by the strategy of nuclear deterrence was, in many ways, the byproduct of our efforts to deter a direct attack on the United States—a bonus effect, in essence, of a military posture. It should not have surprised us that the Soviets also received a "bonus" from creation of their own strategic force, one which the Soviet Premier used to advantage during the 1956 Suez crisis when rattling his rockets against our NATO allies.

The Soviet intermediate-range ballistic missile program could be interpreted as that nation's counter to the "threat" posed by SAC's overseas bases, as the medium-range phase of a counterdeterrent program. But a missile may be aimed in more than one direction; the shadows it casts in peacetime may darken the lives of more than one people.[8]

The distinction between a "deterrent" and a "counterdeterrent" force or strategy depends on which adversary is credited with having the military initiative. The purpose of U.S. military power is deterrent in terms of the American conviction that it is the Soviets who wish to act aggressively and that it is therefore the mission of U.S. forces to convince them that doing so would not be to their advantage. The Soviet purpose is to discourage the employment of American military power and, presumably, to preserve their own freedom to act aggressively despite the threat of nuclear retaliation posed by the United States.

A solution to at least one of their military problems would be to acquire strategic forces of such strength and character that the retaliatory threat posed by SAC would no longer be credible when applied to nonstrategic aggression. Should they achieve such a force, and be convinced that the United States would refrain from irrational or self-destructive use of its strategic nuclear power, they would have countered the U.S. extended deterrence strategy and regained considerable freedom to act militarily in Eurasia.

It is possible that such counterdeterrence has been, since the late 1940's, the mission of the Soviet strategic force. Recently published

[8] A phrase of George F. Kennan's: "Armaments are important not just for what could be done with them in time of war, but for the psychological shadows they cast in time of peace." "Russia, the Atom, and the West," Harper & Bros., New York, 1957, p. 93.

studies of Soviet strategy reveal no clear evidence to the contrary.[4] Even today the Soviet concept of a third world war is said to be one of grinding attrition that is to be finally decided on the ground; their military strategists appear to be placing an increasing emphasis on the importance of surprise attack but to be not yet convinced, as are their American counterparts, that a first strike could decide the conflict. Their thinking on this point must be considered transitional, however, and it would, moreover, be most unwise to assume that published information on Soviet strategy is up to date or even that adequate knowledge of their intentions is attainable. What one can say is that the postwar evolution of Soviet strategy appears to have followed, belatedly, a path similar to that taken by our own.

While Stalin lived there was apparently no basic change in Soviet strategy; his object was to win a ground war in Europe and he remained convinced that the way to do so was by mobilizing and relying upon large and modernized but essentially "conventional" ground forces. Soviet development of strategic airpower began with a bomber of medium range copied from us (the Bull) and was later notable for the mass production of a medium-range jet bomber (the Badger) clearly useful for attack on targets in Western Europe and North Africa. There appeared, in this transitional period, no Soviet counterpart to the U.S. B–36 intercontinental bomber, although it is difficult to tell whether they lacked the capability or the intention to produce such a weapons system. Indoctrination of their own armed forces during this period was heavily larded with propaganda on "capitalist encirclement" and paranoic attributions of hostile intent to the non-Communist world. There was an emphasis, in short, on "defense" in the same sense, but not in the same degree, that Western preparations were defensive in the early stages of the cold war. Such strategies and corresponding capabilities were for the West, but even more for the Soviet Union, insufficient for the deterrence of an opposing nuclear force or for its destruction in a first strike.

By 1954 the effects of nuclear weapons were being taken with increasing seriousness by the Soviet military and a reassessment began of the importance of surprise attack. Soviet estimates of the situation may be assumed to have begun, as ours began, with an appraisal of the threat presented by the opposing strategic force. Whether they looked at U.S. capabilities, in the form of a burgeoning force of strategic bombers well capable of reaching targets in the Soviet Union, or at the intentions so freely expressed in support of the U.S. strategy of extended deterrence, the future may not have appeared promising for the further extension of the Soviet domain or even for the national security of the Soviet Union.

The Soviet response was a buildup of previously neglected air defense systems, gradually intensified programs of civil defense training, an attempt to disperse or conceal key industrial and military installations and an increased emphasis on the development of strategic weapons capable of reaching targets within the United States. One

[4] See, for example, H. S. Dinerstein, "War and the Soviet Union," Frederick A. Praeger, New York, 1959; Raymond L. Garthoff, "The Soviet Image of Future War," Public Affairs Press, Washington, D.C., 1959; and Asher Lee (editor), "The Soviet Air and Rocket Forces," Frederick A. Praeger, New York, 1959.

result was the creation of an impressive strategic air force, albeit one that remained markedly inferior to SAC in size and capability and was thus more appropriate to the neutralization of our strategic air arm by posing the threat of retaliation, than to its actual destruction in a massive counterforce strike.

Soviet counterdeterrence began to affect the actions of the United States and its allies at possibly the same moment at which the Soviets themselves became aware of their capacity to deter the United States from employing its strategic force against peripheral aggression, or of making it credible that the United States would so employ it. Britain and France appear to have taken Khrushchev's Suez "bomb rattling" seriously, and the United States might not have disavowed any intention of intervening in the Hungarian revolt as categorically as it did had Soviet nuclear strength remained at its 1953 level. Faced with the damage this Nation might suffer in the course of a "punitive" strike against an opponent who was himself capable of massive retaliation, the U.S. strategy of nuclear deterrence began to disclose its limitations.

The nuclear guarantee was now at least implicitly withdrawn from certain peripheral areas in recognition of the fact that their security was no longer worth the risks of nuclear war. The problem remained of what to do for deterrence of or defense against more provocative forms of aggression that would affect vital American interests. Here, particularly in the case of the NATO countries, no satisfactory alternative to an increasingly unwarranted dependence on strategic nuclear deterrence has yet been developed. This is partly because the past reliance on the threat of nuclear retaliation was so great as to discourage the development of other military capabilities and partly because the growth of strategic nuclear power has, for the United States at least, been accompanied by a matching decline in those forces appropriate to the deterrence and countering of less than total aggression.

This lack of a viable alternative to the strategy of extended nuclear deterrence emphasizes the serious limitations and weaknesses of both U.S. military capabilities and the strategy that has hitherto guided their development and employment. It is to this problem area, the crisis of nuclear deterrence, that we shall now turn.

PART E. THE CRISIS OF STRATEGIC NUCLEAR DETERRENCE

1. Introduction

American military policy in the cold war is primarily concerned not with the fighting and winning of war but with the discouragement of aggression by the Sino-Soviet bloc, either upon the United States or upon its allies. Logically, therefore, the emphasis is on a strategy of deterrence. While the goal of deterrence itself is not in doubt today, serious questions have been raised about the means by which it can be pursued under present and foreseeable conditions. Specifically, the deterrent value of the U.S. strategic force, on which so much reliance is placed, is being diminished by the rising strategic power of the Soviet Union. The change in the strategic equation reviewed in the last chapter threatens the security of our overseas allies, particularly with regard to the less provocative forms of conceivable Sino-Soviet aggression, and, for a temporary period at least, has greatly increased the risk of a Soviet attack on the continental United States.

If the American nuclear monopoly, coupled with an ample supply of nuclear warheads and delivery vehicles, had contiued to exist, the reliability of the American nuclear deterrent would not now be open to question. The United States and its allies could have remained confident that the threat of massive retaliation against Soviet cities in response to any serious Soviet aggression would have been both credible and effective. As a nuclear monopolist, the United States would not have had to fear the self-mutilating consequences that could follow a strike on an opponent able to retaliate in kind.

With the advent of Soviet nuclear striking power, the situation radically changed. Now, neither side, if it initiates the use of strategic force, can be certain that it would avoid being struck itself by nuclear weapons, unless it can predict with assurance that its first-strike blow against its opponent's strategic forces will be almost totally effective. If one side should achieve such an overwhelming counterforce ability, it could gain or regain the position of a monopolist by employing its strategic power against the strategic forces of its adversary.

Development of the capabilities required for such a knockout blow by either the United States or the Soviet Union is not now likely, although it cannot be ruled out as a future possibility in view of the rapid pace and uncertain predictability of technological developments. As pointed out in an earlier chapter, under foreseeable conditions the differential in force requirements for a reliable counterforce capacity and for the maintenance of retaliatory capability should make it difficult to attain such a counterforce capacity.[1]

[1] See above, pp. 51–53 and 58–61.

However, neither the United States nor the Soviet Union can ignore the possibility that its adversary might someday settle for less than a knockout blow and, rationally or irrationally, be content with a strike at its adversary's retaliatory forces sufficiently crippling to make tolerable the damage it might suffer in return. Conceivably, for instance, one side or the other might consider even very grave damage more tolerable than the risks of allowing its adversary to strike the first blow, should such a strike appear imminent.

2. Deterrence of a Soviet Attack Upon the Strategic Forces of the United States or Its Allies

In order to clarify the problems of American military strategy, deterrence of an all-out Soviet attack, including an attack on the United States and its strategic forces, must be treated separately from deterrence of lesser attacks, restricted in geography or means, because it is the one contingency in which the American ability to retaliate might be gravely impaired—if not destroyed—by the effects of a Soviet first strike against the U.S. strategic force itself.

In view of the assumed disparity between American and Soviet missile capabilities, the dangers of a Soviet surprise attack against SAC must be taken very seriously in coming years. At least through the early 1960's, the American retaliatory force, composed of manned bombers and located on unhardened and unhidden bases, will remain highly vulnerable to such an attack, and this vulnerability will increase as long-range missiles of growing power and accuracy become the principal components of the Soviet strategic force. It is clear, therefore, that American security against a Soviet first strike rests not on the prehostilities strength of SAC, which remains impressive, but rather on the degree of its security against nuclear attack.

Only an assured second-strike or retaliatory capability, sufficient to impress the Soviets of the intolerable level of its destructive potential, can provide even a relatively effective deterrent against a Soviet attack on the continental United States and its overseas allies.

It is unlikely that there will be an abrupt decline in the deterrent value of the U.S. strategic force against a Soviet nuclear attack. Even a relatively small number of surviving bombers, armed with multiple thermonuclear weapons and capable of penetrating to their targets, poses a threat of severe retaliatory destruction. Furthermore, the United States has a variety of delivery systems, including both planes and missiles. One should not exaggerate the dangers of the missile gap period.

But while one should not exaggerate the dangers of the missile gap period, they can also easily be underestimated. A deterrent can never be wholly reliable. There is no certainty that in Soviet estimates a sufficient number of SAC bombers would escape destruction, or reach their targets, or cause damage regarded as intolerable by the Soviets under the given circumstances.

Another consideration influences the effectiveness of the deterrent. It should be recalled that a second-strike or retaliatory capacity must serve two functions: first, to deter an all-out strategic attack, and secondly, if war occurred, to maximize the destruction of the enemy's forces, and to reduce, as much as possible, the destruction to the victim of the attack in subsequent strategic exchanges. These func-

tions suggest conflicting and, in some instances, contradictory target strategies for the second-strike force.

Whereas the aggressor's force must seek to destroy the strategic forces of its adversary in a counterforce blow, the victim in its retaliatory second strike may choose (*a*) a counterforce strike against those of its opponent's strategic forces that have not yet gone into action, in addition to other targets of particular military significance (i.e., communications centers, air defense centers, strategic air bases, gasoline refineries and storage sites, and sensitive industrial targets [2]); (*b*) a strictly terror or city-busting strike; [3] or (*c*) a combination of the two target strategies.

Strategy (*a*) makes the most military sense in the postattack situation—when deterrence has failed—because it seeks to minimize the destruction that the victim of the initial attack may expect to suffer from the aggressor's subsequent strikes. Yet, the deterrent effect of threatening to execute such a strategy may be minimal, particularly if the adversary's strategic forces are isolated from his key civilian and industrial installations, and its actual execution in war may be severely restricted by the opponent's active and passive defenses, by false or inadequate target intelligence, by a paucity of valuable targets (the most dangerous of enemy weapons would have already been used), and, finally, by the diminished size of the second-strike force itself.

Strategy (*b*), the city-busting threat sometimes called that of finite or minimum deterrence, may appear to be the more efficient *deterrent* since it promises a high level of general and indiscriminate destruction to the attacking country. It lacks credibility as a deterrent threat, however, since the victim of the initial attack might be extremely reluctant to invoke the repeated strikes against his own cities that would be sure to follow if he himself struck only the aggressor's civilian targets and left residual strategic forces intact. The probable result of such a strategy would be a round of city-busting strikes in which the aggressor would hold the advantage.[4]

Some authorities have questioned the deterrent value of the strategy of minimum deterrence on these grounds and have suggested that the Soviets might well doubt the credibility of an American threat of city-busting retaliation if they were themselves certain of their ability to pinpoint a first strike on American military targets in such a way as to minimize damage to the American civilian population.[5] The execution of the retaliatory threat against Soviet population centers, invoking subsequent Soviet counterretaliation, would appear to be a strategy of little utility and of particularly devastating consequences for the United States in view of the increasing differential beween American and Soviet levels of civil defense preparedness.

Nevertheless, it does not seem probable that the Soviets would lightly risk the possibility of a mistaken estimate of American inten-

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[2] Cf. the testimony of Secretary of the Air Force James H. Douglas in House Hearings on Fiscal Year 1960 Defense Budget, pt. 1, Feb. 19, 1959, pp. 928–929.

[3] Strategies (*a*) and (*b*) are, of course, theoretical extremes, presented in this form for purposes of discussion. In practice, a counterforce strike would damage civilian targets with blast, heat, and fallout, and a city-busting strike would eliminate those military installations located in or near the target cities.

[4] See the discussion of second-strike strategies in Brodie, "Strategy in the Missile Age," especially pp. 289–294.

[5] Cf. Richard S. Leghorn, "No Need To Bomb Cities To Win War," U.S. News & World Report (Jan. 28, 1955), pp. 79–94.

tions. However irrational a city-busting retaliatory strategy might appear, the United States might well respond to a first strike with all its remaining strategic forces against whatever Soviet targets could be hit, since it would have no time in which to revise its strategic plans. Readiness and a determination to strike back would have to be preserved until the very last minute if the American deterrent is to operate at all.

Finally, strategy (*c*) for the second strike, a combination of the counterforce and city-busting strategies, appears to be that which would almost inevitably be followed in practice, since in such a strike accurate discrimination between civilian and military targets would prove a very difficult task. As General White put it:

> The [second-strike] mission would be * * * to do the greatest possible damage to the Soviet Union as a whole with attention to applying that destruction in such a way as to do as much damage as possible to their residual military striking power.[6]

Nevertheless, in order to maximize the military value of such a strike and to minimize the dangers to civilian populations, a major effort can and should be made to direct the retaliatory attack against the enemy's strategic forces and targets as much as conditions permit.

As was suggested earlier,[7] a "balance of terror" does now exist in the sense that neither side would rationally start a war by an intentional city-busting or terror attack which would leave its adversary's strategic forces intact. It seems more than likely, however, that attacks on cities would occur during the course of a nuclear war either as an act of retaliation or byproduct of counterforce operations or as a result of strategic blunders. This is the rationale behind the belief that civil defense measures would prove worth the costs and efforts required to put them into effect.

During what we have here referred to as the transitional phase of the nuclear-missile weapons generation, the possibility of a Soviet first strike against the continental United States cannot be denied, particularly as SAC will continue to depend heavily on manned bombers vulnerable to missile attack until the mid-1960's. The strategic equation will exhibit a high degree of instability during this period unless some form of effective arms control agreement is reached. It is impossible, of course, to predict whether the Soviets would in fact take advantage of a surprise attack capability if they believed they had attained it through their missile lead. Despite continued high risks discouraging such an attack, they might be tempted to strike if they foresaw an early end to their advantage. Or they might be inclined to exploit their lead before attaining an unmistakably effective first-strike capacity if they feared that the United States would attack first in order to forestall a further serious weakening of its strategic position.[8]

The present high degree of instability in the strategic equation has been hopefully called "transitory" in the belief that the great dangers of the missile gap will diminish as the United States acquires a missile retaliatory force of high invulnerability, numerical strength, and great

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[6] Gen. Thomas D. White, U.S. Air Force Chief of Staff, in House Hearings on Fiscal Year 1960 Defense Budget, pt. 1, Feb. 19, 1959, p. 929.

[7] See above, p. 31.

[8] See above, pp. 88–89, where these pressures tending toward the outbreak of hostilities were discussed as "time-phasing" sources of instability.

variety. Once the United States acquires such a retaliatory force, the dangers of a premeditated first strike at the strategic forces of the United States and its allies will be greatly lessened, and the American strategic deterrent will regain a considerable measure of reliability. It should be stressed, however, that new technological developments favoring the offense or a relaxation of American efforts to maintain an adequately protected and effective second-strike capability could again rob the American retaliatory force of its ability to strike back. Because technological developments will continue and, possibly, at an accelerating pace, a continuous and most costly effort will be necessary to preserve the effectiveness of the deterrent. The degree of effort required, and the form it will have to take, will be largely determined by our estimates of the size and quality of Soviet counterforce abilities in the decade ahead.

3. Deterrence of Attacks on America's Overseas Allies

We must now turn to the second danger posed by growing Soviet strategic capabilities—the diminishing effectiveness of American strategic nuclear power as a deterrent against a wide spectrum of aggressions against overseas free world areas or against other violations of vital American overseas interests.

Under conditions of American nuclear supremacy, SAC was able to spread a protective "nuclear umbrella" over the rimland countries of Eurasia by its threat of strategic intervention. Now, however, with the rising Soviet strategic counterdeterrent, the credibility of this American threat is being questioned, and its usefulness as a rational instrument to aid in the protection of our overseas allies has proved limited, as applied to all but the more serious and unambiguous forms of Sino-Soviet aggression.

In order to have a reliable deterrent against overseas aggression, the United States would have to possess a counterforce capability for a first strike at the Soviet Union that could be expected to reduce Soviet counterretaliation against the United States to tolerable proportions. This precondition raises two serious problems. First, the acquisition of such a counterforce capacity in the missile age may prove impractical in terms of the number of missiles required, and, secondly, the efforts required for its attainment would greatly increase the instabilities of the strategic equation and thus the risk of total nuclear war.

As indicated in an earlier chapter, the maintenance of an effective counterforce capability would require not a mere matching of Soviet missile forces, but the accumulation of American missiles in numbers substantially exceeding the numbers of Soviet launching sites. The low relative accuracy, reliability, and warhead power of at least the first generation missiles suggest that from 6 to 60 of them may be needed to "take out" a single enemy launching site under various circumstances. Although this disproportion will be reduced by refinements in nuclear warheads and missile accuracy, it is unlikely to approach a 1:1 missile-to-target ratio against hardened or mobile military targets.

An effort to attain adequate strategic counterforce capability would remain practical if the Soviets continued what appears to be their

present pattern of creating only a counterdeterrent force. That this is the Soviet objective today is suggested by the limited size of the Soviet bomber fleet, as well as by Mr. Khrushchev's recent statement that the Soviet Union already possesses the number of missiles requisite to implement its strategy.[9] However, the United States can ill afford to rely on such a reassuring estimate of Soviet intentions, nor can it assume that Soviet force goals will not be increased in the future. If the Soviets utilized their assumed capacities for the production of long-range missiles, they might in the course of a few years achieve a formidable retaliatory force. Thereafter, an attempt to create a force capable of "taking out" or severely crippling Soviet retaliatory power might prove not only prohibitively expensive but impossible in view of the number of American missiles and the amount and quality of target intelligence required. The goal of only a moderate amount of counterforce ability, on the other hand, would do little to increase the deterrent effect of our strategic force against Sino-Soviet aggression on our allies, although such a level of counterforce ability may prove useful for purposes that will be discussed later.[10] The threat of an ineffective counterforce first strike at the Soviet Union that would invite devastating Soviet retaliation would be little more credible than the threat to hit Soviet cities. There is no half-way station on the road to first-strike capability, and the trends in technological development and the race for increased invulnerability of retaliatory power militate against reaching this destination. Any attempts to overcome these obstacles, moreover, must almost necessarily provoke a spiraling and extraordinarily costly arms race.

The second dilemma in the attainment of preservation of the strategic deterrent is the incompatibility between the goals of continued counterforce capabilities and of minimizing the risk of total nuclear war. In line with the strategy of deterrence pursued to date, the United States has equipped itself with forces that are obviously and, in some instances, uniquely fitted for a counterforce first strike. These include our medium-range bombers supplemented by IRBM's in advanced positions that are both highly vulnerable and therefore more suitable for a first strike than a second. With these characteristics, the present U.S. strategic force may in fact be regarded by the Soviets as evidence of American "aggressive" intentions. The mere existence of a strategic force of this character could tempt them therefore to undertake a preventive counterforce attack, once they attained an adequate counterforce capability. Similarly, a buildup of Soviet forces designed for a first strike would be regarded as provocative by the United States, and would in turn lead to a high level of instability in the strategic equation.

The emergence of the Soviet counterdeterrent does not mean that the threat of American strategic intervention has lost—or is likely to lose—all of its deterrent value against every kind of Sino-Soviet aggression in the Eurasian rimland areas, particularly in areas of vital interest to the United States. On the contrary, the threat of a retaliatory first strike against a Soviet *nuclear* assault on Allied

[9] From his May 11, 1959, Kiev speech: "We have good rockets and in the necessary quantity. We are adding more rockets but we see that we are not in need of that many. Perhaps it will not be long before we begin to curtail the production of rockets. This is not an article like, let us say, a cucumber which you can pickle and all that remains is to eat it. Rockets are delicate things."

[10] See below, pp. 117–118.

countries will remain virtually as credible as the threat of strategic retaliation against a Soviet attack on the United States itself. The Soviet risks in such an assault would exceed all rational limits, since, in sparing the United States, the Soviets would be leaving SAC intact, and, therefore, able to retaliate with its full prehostilities strength. Even if retaliation by SAC left the Soviets with the capacity to do serious damage to the United States in return, the probability that SAC would fulfill its retaliatory threat should be sufficiently high to deter a Soviet nuclear assault on allies of the United States.

There is little reason, therefore, for these allies, particularly those in NATO, to fear that a nuclear stalemate would turn the United States and the Soviet Union into sanctuaries of a future war, while leaving other free world countries exposed to Soviet nuclear attack. Instead, these countries too would benefit from the protection such a stalemate would offer against all strategic nuclear aggression.

Against other less extreme forms of aggression, the American nuclear deterrent will continue to decrease in credibility as Soviet counterdeterrent power increases. It will, therefore, become a less reliable and appropriate instrument for the policy of containment that seeks to protect the overseas countries against a wide range of possible forms of aggression below the strategic level of nuclear attack. Sino-Soviet threats to free world security range from such nonmilitary acts as a blockade of West Berlin, or subversion on the Czech model, to aggression with substantial conventional military forces.

It is generally conceded already that the threat of "massive retaliation" does not apply to peripheral cases of aggression, or to indirect aggression. There is little possibility that the threat of SAC's intervention will appear credible in these cases, in view of the disproportion between the relatively low American interests at stake and the losses the United States would suffer if it fulfilled its threat.

Between such peripheral threats to free world security and a Soviet nuclear attack on the United States or its allies there remains, however, a large "middle ground" of conceivable Sino-Soviet provocations, and it is in this area that the questionable reliability or wisdom of American strategic intervention has become an issue of grave concern. These uncertainties stem from the fact that no realistic alternative to the instrument of American strategic power is presently available for the protection of our overseas allies.

It would be too pessimistic to assert that the threat of American strategic intervention has lost all deterrent value with respect to this middle ground. An important role is played here by American determination to intervene, a determination forcefully expressed in both official and unofficial circles in this country. Whether or not American intervention would be a rational move, the Soviet Government can never be sure that it will not take place. Because the Soviets can never be certain of the level of aggressive actions that would provoke American retaliation, they would be risking the destruction of much of their strategic force and many of their cities in committing one of the "middle ground" acts of aggression. It is doubtful that they could believe the gains they hoped to achieve in such attacks would outweigh the risks incurred. In this sense, the uncertainty of U.S. intentions and reactions continues to exert a valuable deterrent effect upon Sino-Soviet expansionist moves.

Nevertheless, the United States and its allies remain in a dangerous position as long as they must rely primarily on the effectiveness of such a form of deterrence. The consequences would be grave, indeed, should this deterrent fail to deter. If the Soviets regarded the threat as a bluff, if they misjudged the limits of the peripheral forms of aggression they might safely undertake, or if they attacked regardless of the threat—through irrationality or fanaticism, under strong provocation or in despair—the United States would be forced to choose between allowing its allies to be overrun by Communist bloc forces or engaging in a course of action that might well result in the nuclear devastation of large areas of the United States.

The precariousness and dangers of these situations will necessarily increase as growing Soviet strategic power diminishes the credibility of the American deterrent. Therefore, both the United States and its allies have a vital interest in establishing a more reliable deterrent to limited Sino-Soviet assaults and in creating thereby less self-destructive defenses than American strategic forces can now provide. In fact, if no military alternative is found, the underpinnings of the American collective defense system, on which American foreign policy now rests, will be gravely weakened, and the United States might be left with only the desperate alternative of retrenchment and isolation in a Fortress America.

4. Alternatives to the American Strategic Deterrent

A. INDEPENDENT ALLIED STRATEGIC POWER

One alternative to the obvious expedient of strengthened local forces should be mentioned here, since it has gained wide attention in Britain, France, and, to a lesser extent, in other European countries. It is asserted that independent Allied strategic nuclear forces would have more deterrent value than SAC because their intervention, in case of an attack on the countries in question, would not be open to doubt.[11] The validity of this view can, however, be very seriously questioned. It is hard to see how these independent but necessarily very weak strategic forces could exert any appreciable deterrent effect that is not already being provided by the U.S. strategic force. A relatively small number of nuclear warheads and carriers, such as Britain possesses and France and other countries hope to acquire, can support, at best, a strategy of "minimum deterrence"—the threat of a terror attack on Soviet cities, not a counterforce blow at Soviet strategic forces. But if, as was suggested earlier in this chapter, a threat of city busting even by the United States or the Soviet Union will lack credibility except in response to a nuclear attack, it is much less credible that a country attacked by *conventional* forces would initiate rounds of city busting in which it must expect the obliteration of most of its urban centers in return for its destruction of only a few Soviet cities. If, instead, a European country were attacked with nuclear weapons, it is not only doubtful whether its small strategic forces would be able to survive and to retaliate at all, but such an attack on American allies is almost inconceivable unless coupled with a counterforce attack on SAC which would provoke American retalia-

[11] See a discussion of European support for this alternative in Alastair Buchan, "Wanted: A European Deterrent," The Reporter, vol. 21, No. 6 (Oct. 15, 1959), pp. 28–30.

tory action far more devastating than anything European countries could hope to produce.[12]

B. NONSTRATEGIC FORCES

If maintenance of American first-strike counterforce capabilities comes to be regarded as an impossible or—if stability is given high priority—an undesirable objective, U.S. strategic nuclear power will have lost much of its effectiveness as a deterrent against limited Sino-Soviet attacks on our overseas allies. If, at the same time, American second-strike capabilities continue to operate as an effective deterrent against a Soviet first strike, a nuclear stalemate or a condition of relatively stable mutual deterrence will exist on the strategic level. Under these conditions, neither side will regard the initiation of strategic nuclear war as a rational military policy, either in response to a nonnuclear attack or for aggressive purposes, either between themselves or in defense of their allies.

Such a stalemate, it must be emphasized, is no guarantee against either war by accident or war in general. Rather than discouraging or deterring limited and local wars, the strategic stalemate puts a premium on the use of superior nonstrategic military power by aggressive nations pursuing goals they cannot expect to attain without violence. Therefore, unless a nuclear stalemate, or state of mutual deterrence, is extended to the nonstrategic level, Soviet superiority on this level will represent a serious threat to the security of our overseas allies. Moreover, this asymmetry is a possible source of wars that may get out of hand and become "total," despite initial limitation.

The present nonstrategic capabilities of the United States and its allies should not be underestimated. In some instances of "brushfire wars"—even in wars as extensive as the war in Korea—the Western forces deployed locally or in the vicinity of the conflict, reinforced by forces located elsewhere or by subsequently mobilized reserves, may be able to cope with a nonnuclear Communist assault. In the case of Quemoy, for example, it would appear that sufficient forces were available for its defense, and that there was little need for the threat of American strategic intervention, however credible that threat might have been against a country deemed incapable of nuclear retaliation.

The ability of American and allied forces to cope with a similar Communist threat might be in question, however, if a number of relatively minor assaults were launched simultaneously at widely scattered points along the fringes of the Iron and Bamboo Curtains. Such a situation might easily overtax the modest American ready reserve forces as well as the now minimal U.S. airlift capacity with which to supplement inadequate allied and American forces already deployed overseas.

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[12] Roger Hilsman in his "Devolution of Responsibility" (East-West Negotiations, The Washington Center of Foreign Policy Research, 1958, pp. 19–27) suggests that, while there are obvious dangers in the spread of nuclear weapons to additional nations, a trend in this direction is inevitable. Hilsman suggests that the United States should not oppose the development of nuclear weapons by its allies, but try instead to channel these programs toward useful ends. If the United States supplied its allies with nuclear weapons, the article states, the resulting devolution of nuclear strength and responsibility might bring about a more stable and satisfactory division of labor within the alliance than the present relationship of dependency.

A major dilemma facing the United States and its allies today is the problem of providing the NATO area with adequate protection against Soviet assaults that would either be so limited or so ambiguous as not to provoke American strategic intervention or that would have tragic consequences, if they did. As we have seen, the existence of the American strategic striking force sets a ceiling on the size of such Soviet assaults on Western Europe not coupled with a concomitant strike on American strategic power.

To date, the overwhelming potential of Soviet conventional capabilities has tended to discourage local NATO efforts to remedy the imbalance by providing an adequate NATO "Shield."[13] There was little incentive for such efforts as long as European confidence in the American "Grand Deterrent" (the NATO "Sword") remained unshaken. NATO planners have not regarded as impractical the task of building up a NATO Shield of local forces that could prevent Soviet armies from overrunning Western Europe on the assumption, however, that American strategic intervention would take place and would cripple the ability of the Soviet Union to reinforce its armies in the field and to continue the war. While the early Shield force goal of 96 divisions, envisioned at the Lisbon Conference of 1952, was soon abandoned, in the face of political, psychological and economic obstacles in Western Europe, NATO turned in 1954 to tactical nuclear weapons as a hopefully less costly substitute for the defensive power of the unattainable conventional ground divisions.[14] At the time, it was assumed that these weapons would provide enough firepower to counter the offensive abilities of numerically far superior Soviet ground forces.[15]

Grave doubts about the wisdom of the NATO decision to rely so heavily on the use of tactical atomic weapons have been raised. Tactical nuclear warfare, as has been pointed out by both United States and Soviet military authorities, may easily require more manpower rather than less because of high casualty rates that will rapidly be sustained. It is doubtful in this context whether a small defensive army, equipped with tactical nuclear weapons, could hold against a larger one equally armed. The European peoples are, in any event, awakening to the fact that a tactical nuclear war on their soil could easily obliterate many of the areas that it was intended to defend.

As mentioned earlier, it is conceivable that, by tacit agreement or as part of an international arms control scheme, general support could be gained for the proposition that the unilateral defensive use of tactical nuclear weapons by a victim of invasion is permissible within its own borders and airspace, while the invader may not reciprocate in kind.[16]

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[13] See Arnold Wolfers, "Europe and the NATO Shield," International Organization, vol. XII, No. 4 (Autumn 1958) pp. 425–439.

[14] At present, the NATO forces in the central European area (not including Greece and Turkey) are estimated at roughly 21½ combat-ready divisions, although this estimate may be deceptively large in view of differing interpretations of what constitutes a "combat-ready" division.

[15] It is usually estimated that Soviet Army strength remains at 175 divisions, of which almost 140 are operational. Of these latter, 80 divisions are stationed in western Russia, and 20 mechanized, 2 artillery, and 8 antiaircraft divisions are said to be in East Germany. The remainder are stationed in Poland, Czechoslovakia, and Hungary. To these Soviet divisions must be added roughly 44 satellite divisions, whose political reliability may be doubted.

[16] See above, p. 96.

Under present circumstances, it would appear that the NATO Shield forces need tactical nuclear weapons less as a means to counter a nonnuclear Soviet attack than in order to deter Soviet employment of tactical nuclear weapons. The possession of these weapons by both sides tends to enhance the possibility that a state of mutual deterrence may be extended to the tactical nuclear level in Europe. If it is, the great numerical superiority of the Soviet conventional ground force is brought into full relief.

In Europe, as well as in the United States, it is widely held that NATO cannot afford—financially, politically, or psychologically—to support dual-purpose forces (able to fight either a nuclear or a conventional war) strong enough to deter or, if necessary, to stop the Soviet "steamroller" from overrunning Europe. It is argued that Europe either must be protected by American and European strategic deterrents, or it will be at the mercy of Soviet capabilities and intentions. It may be questioned, however, whether this proposition is not excessively defeatist, despite the ominous implications of the receding deterrent value of strategic nuclear force.

As mentioned earlier, if the Soviets did, in fact, contemplate a conventional military assault on Western Europe, the larger the attack they made, the greater the risks they would be taking of American strategic intervention. It seems unlikely, therefore, that the Soviet Union would dare launch against Western Europe the mass armies presently stationed between the Iron Curtain and the Urals, a form of attack that would almost certainly trigger SAC's intervention. The Grand Deterrent still operates to discourage all but the more limited or ambiguous military assaults on Western Europe.

The real danger is not the threat of invasion by Soviet mass armies but of a surprise attack by the Soviet forces currently deployed close to the Iron Curtain, particularly the 22 combat-ready and well-equipped Soviet divisions stationed in East Germany. Despite the odds, the Soviets might conceivably gamble that, in such an attack, they could create a fait accompli in Europe with such speed that the United States would hesitate, after the fact, to launch a first-strike retaliatory blow of possible devastating consequences to itself. Another danger is a nonmilitary Soviet act, like a blockade of Berlin, against which the threat of massive retaliation might not seem credible. In neither of these cases nor in other similar contingencies would NATO face or have to match the massive power of the Soviet "steamroller."

In the light of these considerations, the demand of General Norstad, the Supreme Commander of NATO forces in Europe, for a Shield of at least 30 divisions is a reasonable request. Provided they are trained and equipped as dual-purpose forces, these divisions should be able to hold against an attack by the 22 Soviet divisions presently stationed in East Germany and supplemented by other Soviet divisions now deployed in nearby countries. In an operation of this kind, however, NATO should be able to count upon a far greater supply of readily available reserves than exist today.

The establishment of a Shield force of 30 divisions, backed by adequate and readily available reserves, can hardly be assumed to exceed the capacity of the present economies of the NATO countries. The major obstacle blocking General Norstad's goal is a psychological one

that stems in part from the continued European hope that protection will be provided by American strategic power. In part, it arises from the belief that the development of independent European strategic deterrents will obviate the necessity of a larger Shield. And, finally, there is a general and deep-seated skepticism in Europe concerning the possibility of countering Soviet numerical superiority with anything but nuclear weapons.

The extent to which this skepticism is justified is a question of the greatest importance for American consideration, since the United States is vitally interested in the creation of adequate local defense forces in Europe as well as elsewhere around the perimeter of the Soviet bloc. If European skepticism on this score is not justified, it should be dispelled. For this purpose, further investigation should be made of the technological improvements applicable to localized and regional warfare, such as the "ground effect" troop and weapons carriers and the lightweight anti-tank missiles earlier discussed. It is possible that a concentrated effort to develop capabilities of this order could do much to offset Soviet numerical and mechanized strength.

Recently, there has been a marked tendency in military thinking and analysis, both in the United States and abroad, to become more and more absorbed in the problems raised by the advent of nuclear weapons and by the distribution of power on the strategic level.[17] While these problems are grave and immediate and deserve serious consideration, greater efforts should be made to investigate the neglected problems of nonnuclear armaments and warfare and the methods by which the effectiveness of conventional defensive forces and tactics can be enhanced. It would be a calamity if, in the event of a nonnuclear war, military thought and military preparations of the free world were found to have been based chiefly on weapons, tactics, and experience of past wars instead of having taken full advantage of new technological opportunities in the field of nonnuclear warfare.

These opportunities should not be neglected on the assumption that tactical nuclear weapons can compensate for military weakness in other areas. As earlier mentioned, it is far from established that tactical nuclear weapons can make up for numerical inferiority to an enemy similarly armed, or even that their employment will tend to favor the defensive in land combat.

No clear distinction exists between tactical and strategic nuclear weapons, or tactical and strategic targets, and there are real dangers that a tactical nuclear war might rapidly degenerate into that general nuclear war which it is our purpose to avoid.[18] There are, in addition, areas of the world in which the initiation of nuclear war in any form would hold severe political and psychological penalties for the United States.

Even should tactical nuclear war appear clearly in our interest in some specific instance, such warfare—as it is now envisaged—will

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[17] Cf. the discussion on the feasibility of conventional war in the nuclear age by James E. King, Jr., in "Nuclear Plenty and Limited War," Foreign Affairs, vol. 35, No. 2 (January 1957), pp. 238–256.

[18] See the discussion of this problem by Hanson W. Baldwin in "Limited War," The Atlantic, vol. 203, No. 5, May 1959, pp. 35–43. Baldwin notes that the tendency in simulated nuclear battles has been to start out with small numbers of weapons, but to move rapidly to more, and more powerful, nuclear weapons to insure the destruction of important targets.

require a very high level of ability in military transport, communications, target reconnaissance, and other "conventional" capabilities.

5. Preservation of a Measure of Counterforce Ability

It has been suggested that the growing invulnerability of strategic forces and the desire to minimize instabilities in the strategic equation may lead the United States and possibly the Soviet Union to abandon their efforts to strive for effective first-strike counterforce capabilities. However, preservation of some measure of counterforce ability remains useful for other purposes and, in fact, a decision to abandon the first-strike race would not eliminate all American counterforce capabilities, since some of the weapons and delivery systems necessary for a retaliatory second-strike capacity will be sufficiently accurate and powerful to perform counterforce missions as well as terror attacks.[19]

There are several considerations that call for a continuation of present efforts to maintain counterforce capabilities, even if the goal of an effective first-strike force itself were relinquished.

First, if war should break out, even a localized or limited war, the United States would be severely handicapped in its strategic and political choices if it had no means of hitting elements of the enemy's strategic force, while the enemy had substantial counterforce capabilities. In a war confined to the Middle East or Asia, for example, an ability to take out strategic targets within a limited geographical area would seem indispensable, even if mutual deterrence on the highest strategic level precluded an all-out counterforce strike.

Second, in the case of a total strategic nuclear war in which the United States was the victim of a first strike, the counterforce abilities of the American second-strike force would enable the United States to conduct militarily useful operations and to minimize the damage to its own population and industrial centers that might be inflicted by subsequent Soviet strategic strikes following the initial attempt at a knockout blow.

Thirdly, a strong case can be made that only by continuing its research efforts in the field of counterforce weapons can the United States attain any degree of insurance against upset of the strategic balance by as yet unforeseen Soviet weapon developments.

Finally, American maintenance of even a moderate inventory of counterforce weapons would, it is argued, force the Soviets to divert funds from efforts to achieve an effective first-strike counterforce ability into expensive efforts to protect their existing strategic forces. In the absence of this pressure, it is said, the Soviets would be able to concentrate on their counterforce drive and would have an easier task in breaking the nuclear stalemate. Against this argument, however, it can be held that the ratio of expenditures favors the defense, not the offense, since the side seeking counterforce abilities

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[19] The increased performance demanded from modern strategic weapons systems has tended to limit their flexibility in this regard. While the most vulnerable of these systems, the manned bomber, can deliver multiple thermonuclear weapons against point military targets with great precision, this is not true of the present liquid fuel ICBM's. The mobile or superhardened solid fuel missiles of the 1960's, such as the Polaris and Minuteman, are not now expected to have either the accuracy or destructive power desirable for counterforce missions against protected military targets. ICBM's in addition, can only be employed against those targets whose location has been established with a considerable degree of precision prior to their launching.

must spend a multiple of the sum spent by its opponent on the invulnerability of its strategic retaliatory forces. Therefore, if the United States exploited the advantages of this ratio by concentrating on the protection of its second-strike force rather than on first-strike counterforce abilities, it might force the Soviet Union either to abandon hopes of overcoming U.S. retaliatory abilities or to risk financial exhaustion and possible failure in such a race.

In summation, the critical situation created by the decline in the deterrent value of the American strategic force, a result of technological developments and corresponding changes in the strategic equation, demands new military efforts by the United States and its allies. If they are made—and made in time—it will not be necessary to consider revisions in the basic objectives of American foreign policy or to sacrifice the present alliance policy which is a precondition of their pursuit. On the contrary, it is not overoptimistic to expect that a relatively stable strategic-nuclear stalemate and a reasonable degree of protection against nonstrategic aggression can be established, provided the United States equips itself with a secure retaliatory missile force and, with its allies, creates strong dual-purpose defense forces backed by readily available reserves.

APPENDIX

STUDY: DEVELOPMENTS IN MILITARY TECHNOLOGY AND THEIR IMPACT ON UNITED STATES STRATEGY AND FOREIGN POLICY

The Washington Center of Foreign Policy Research, The Johns Hopkins University, 1906 Florida Avenue NW., Washington, D.C.

Submission date: September 15, 1959

Purpose.—This study will be concerned primarily with the interrelationship between military capabilities, strategic doctrine, and foreign policy. It will examine the kinds of breakthrough in weapons development which could radically alter the balances of world military power over the next 10 years and consider the implications of such changes upon strategic military doctrine and foreign policy.

OUTLINE OF STUDY

I. Summary of main findings.
II. Conclusions and recommendations.
III. Body of the report.
  A. General introduction: The interdependence of technological development, military power, strategic doctrine, and foreign policy, with special emphasis on the role of the technological factor.
  B. U.S. interests and foreign commitments governing U.S. defense policy.
    1. The cold war in the context of overall U.S. foreign policy.
      (*a*) The primacy of defense.
      (*b*) The military component of defense.
      (*c*) Defense of home base and other non-Communist countries (the policy of "going it with others").
    2. The scope of U.S. foreign military commitments.
      (*a*) Collective defense and unilateral guarantees.
      (*b*) Collective security under the United Nations Charter.
    3. Major strategic implications.
      (*a*) The global nature of U.S. strategy.
      (*b*) The problem of projecting U.S. power to Eurasia.
      (*c*) The challenge of the arms race and of technological competition.
  C. Technological development and the world balance of military power.
    1. Generations of military technology.
      (*a*) The conventional generation.
      (*b*) The nuclear generation.
      (*c*) The nuclear-missile generation.
      (*d*) The prospects of new generations.
    2. Technological and nontechnological factors in the balance of military power.
    3. Phases in the world balance of military power.
      (*a*) U.S. nuclear monopoly.
      (*b*) U.S. nuclear superiority.
      (*c*) The "balance of terror" and imbalances of defense.
      (*d*) Future possible changes in the balance.
    4. Significant technological changes, recent and prospective.
      (*a*) Technology and nuclear striking power.
      (*b*) Technology and the tactical forces.
      (*c*) Technology and outer space operations.
      (*d*) Technology and air defense.

III. Body of report—Continued
D. U.S. strategic doctrine, in the light of technological development.
1. Concepts of deterrence and defense.
2. Current doctrine and controversies.
(*a*) Deterrence versus defense.
(*b*) First strike versus retaliatory strategy.
(*c*) Counterforce versus reprisal strategy.
(*d*) General versus less-than-general war.
(*e*) The "grand deterrent" versus other deterrents.
(*f*) Tactical nuclear versus conventional warfare.
(*g*) Overseas deployment versus central reserves.
(*h*) Foreign versus zone-of-the-interior bases and launching sites.
(*i*) Local defense versus strategic reprisal.
3. The future evolution of strategic doctrine (alternative courses and their respective merits).
E. Implications of technological development (recent and prospective) for U.S. defense policy.
1. Selected problems of future U.S. defense policy; alliance policy.
(*a*) Nuclear sharing and military assistance policies.
(*b*) Disarmament policy.
(*c*) Balancing of power policy.
2. Future requirements of U.S. defense policy (estimates and speculations).

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